PATENT ABSTRACTS OF JAPAN

(11)Publication number : 05-258859

(43)Date of publication of application : 08.10.1993

(51)Int.Cl. H05B 33/12

(21)Application number : 04-347927

(22)Date of filing : 28.12.1992

(71)Applicant : EASTMAN KODAK CO

(72)Inventor : TANG CHING W
LITTMAN JON E

(30)Priority

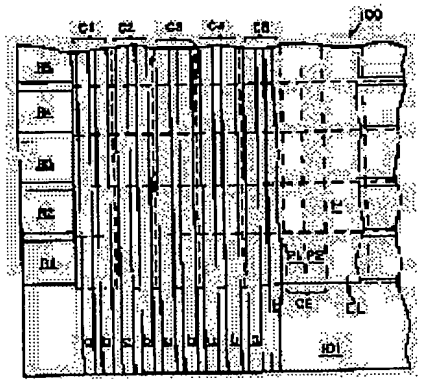
Priority number : 91 814163 Priority date : 30.12.1991 Priority country : US

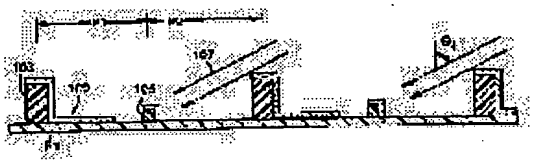
(54) LIGHT EMITTING DEVICE AND MANUFACTURE THEREOF

(57)Abstract:

PURPOSE: To manufacture an organic electro-luminescent multi-color image display device by providing one of first and second electrodes divided into at least two elements disposed transversely with intervals, each of which bonding a secondary pixel portion of an organic electro-luminescent medium in the same file.

CONSTITUTION: First electrodes R1, R2... are provided on the top face of a substrate 101 by coating In-Zn oxide on a glass substrate. Next, walls 103 and 105 are formed on a line boundary of a pixel region, and there are provided with an organic electro-luminescent EL medium and second electrodes C1, C2... laminated thereon. Here, these electrodes connect a pixel P in an X-Y addressing pattern. An organic EL medium in each pixel forms at least two secondary pixels P1, P2 each capable of light emitting with a different phase. Each of them bonds a secondary pixel portion of an organic EL medium in the same file.





LEGAL STATUS

[Date of request for examination] 27.12.1999

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number] 3369615

[Date of registration] 15.11.2002

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

CLAIMS

[Claim(s)]
[Claim 1] In the luminescence equipment which changes including the image display array which consists of two or more luminescence pixels arranged in 2 sets of crossing parallel files, the pixel in the parallel file of a group forms a line for a start [;]. moreover, the pixel in the second-set parallel file -- a train -- forming -- **** --; -- each pixel It is arranged on the light transmission nature substrate of common electric insulation. Each pixel in the same file of the parallel file of; one group An electrode means is contained for a start [common / light transmission nature] which has been arranged on a substrate, and it is joined by this means. The first electrode means in the contiguity file of; one group On the substrate, spacing is opened in a longitudinal direction, it is arranged, and the; organic electro luminescent medium is piled up on this first electrode means. Each pixel in the same file of the parallel file of the group of; remainder The common second electrode means arranged on this organic electro luminescent medium is contained, and it is joined by this means. The second electrode means in the contiguity file of the group of; remainder On this organic electro luminescent medium, spacing is opened in a longitudinal direction and it is arranged. The organic electro luminescent medium in; each pixel At least two secondary pixel fields which can emit the light of the hue from which each differs are formed. To; each pixel The wall arranged along the boundary which has separated two secondary pixel fields is established.; this wall In each file which it has the height exceeding the thickness of this organic electro luminescent medium, and shade can be given to the adjoining secondary pixel field, and is the pixel of; and a specific group Either said first electrode means or said second electrode means is luminescence equipment characterized by the multi-colored picture image display currently divided to the component by which each opened spacing in at least two longitudinal directions which have joined the secondary pixel part of the electro luminescent medium in the same file , and has been arranged be possible .
[Claim 2] In the luminescence equipment which changes including the image display array which consists of two or more luminescence pixels arranged in 2 sets of crossing parallel files, the pixel in the parallel file of a group forms a line for a start [;]. moreover, the pixel in the second-set parallel file -- a train -- forming -- **** --; -- each pixel It is arranged on the light transmission nature substrate of common electric insulation. Each pixel in the same file of the parallel file of; one group An electrode means is contained for a start [common / light transmission nature] which has been arranged on a substrate, and it is joined by this means. The first electrode means in the contiguity file of; one group On the substrate, spacing is opened in a longitudinal direction, it is arranged, and the; organic electro luminescent medium is piled up on this first electrode means. Each pixel in the same file of the parallel file of the group of; remainder The common second electrode means arranged on this organic electro luminescent medium is contained, and it is joined by this means. The second electrode means in the contiguity file of the group of; remainder On this organic electro luminescent medium, spacing is opened in a longitudinal direction and it is arranged. The organic electro luminescent medium in; each pixel The wall is arranged along two boundaries where three secondary pixel fields which can emit the light of the main hues from which each differs are formed, and; each pixel faces each other. The middle wall in each pixel is making it dissociate from two secondary pixel fields of the remainder of a secondary pixel field one. This wall has respectively the height exceeding the thickness of this organic electro luminescent

medium, and shade can be given to the adjoining secondary pixel field.; and each electrode means of the parallel file of one group Luminescence equipment characterized by all the color image display currently divided to the component by which each opened spacing in three longitudinal directions which have joined the secondary pixel part of the electro luminescent medium in the same file, and has been arranged being possible.

[Claim 3] Change including the image display array which consists of two or more luminescence pixels arranged in 2 sets of crossing parallel files, and the pixel in the parallel file of a group forms a line for a start [;]. moreover, the pixel in the second-set parallel file — a train — forming — **** —; — each pixel It is arranged on the light transmission nature substrate of common electric insulation. Each pixel in the same file of the parallel file of; one group An electrode means is contained for a start [common / light transmission nature] which has been arranged on a substrate, and it is joined by this means. The first electrode means in the contiguity file of; one group On the substrate, spacing is opened in a longitudinal direction, it is arranged, and the; organic electro luminescent medium is piled up on this first electrode means. Each pixel in the same file of the parallel file of the group of; remainder The common second electrode means arranged on this organic electro luminescent medium is contained, and it is joined by this means. The second electrode means in; and the contiguity file of the remaining groups In the manufacture approach of the luminescence equipment which opens spacing in a longitudinal direction and is arranged on this organic electro luminescent medium The process which forms the second electrode means in the front face of the organic electro luminescent process; this medium which makes an organic electro luminescent medium adhere to the process; this substrate front face which offers the substrate with which the first electrode means opens spacing in a longitudinal direction, and is arranged on the front face;; A substrate top, Before making an organic electro luminescent medium adhere on the first electrode means which opens spacing in a longitudinal direction and is arranged The process which forms 1 set of parallel walls; A substrate front face is received in the first source for the vacuum evaporationo for part I of an organic electro luminescent medium. Orientation is carried out at the include angle which puts and sandwiches each wall between said sources and adjacent parts on the front face of a substrate. In that case the amount of [of this organic electro luminescent medium] part I The process selected so that the electroluminescence of the first hue may be given; A substrate front face, To fields other than the field where the wall is put and inserted between said sources and substrate front faces The process to which the amount of [of an electro luminescent medium] part I is made to adhere alternatively; A substrate front face, The amount of [of an electro luminescent medium] part II is made to adhere to the substrate surface field to which the amount of [of an electro luminescent medium] part I does not exist. In that case the amount of [of this electro luminescent medium] part II The process selected so that the electroluminescence of the second different hue from each of the first hue may be given; at least spacing as an electrode component opened and arranged in the first and the second longitudinal direction to a list Each of an electrode means to join 1 set of files is formed. In that case the first electrode component in each file The pixel field in the same file containing a part for part I of an electro luminescent medium is joined. And the second electrode component in each file The manufacture approach characterized by manufacturing the image display array which has the multicolor display engine performance according to the process which joins the pixel field which does not contain a part for part I of an electro luminescent medium.

[Claim 4] Change including the image display array which consists of two or more luminescence pixels arranged in 2 sets of crossing parallel files, and the pixel in the parallel file of a group forms a line for a start [;]. moreover, the pixel in the second-set parallel file — a train — forming — **** —; — each pixel It is arranged on the light transmission nature substrate of common electric insulation. Each pixel in the same file of the parallel file of; one group An electrode means is contained for a start [common / light transmission nature] which has been arranged on a substrate, and it is joined by this means. The first electrode means in the contiguity file of; one group On the substrate, spacing is opened in a longitudinal direction, it is arranged, and the; organic electro luminescent medium is piled up on this first electrode means. Each pixel in the same file of the parallel file of the group of; remainder The common

second electrode means arranged on this organic electro luminescent medium is contained, and it is joined by this means. The second electrode means in; and the contiguity file of the remaining groups In the manufacture approach of the luminescence equipment which opens spacing in a longitudinal direction and is arranged on this organic electro luminescent medium The process which forms the second electrode means in the front face of the organic electro luminescent process; this medium which makes an organic electro luminescent medium adhere to the process; this substrate front face which offers the substrate with which the first electrode means opens spacing in a longitudinal direction, and is arranged on the front face;; A substrate top, Before making an organic electro luminescent medium adhere on the first electrode means which opens spacing in a longitudinal direction and is arranged The process which forms 1 set of parallel walls which demarcate the edge where the pixel in 1 set of files faces each other; A middle wall parallel in the pixel in each of 1 set of files is made to form in coincidence. The process which brings close and arranges each middle wall rather than the another side to one side of the two ******** in the edge of a pixel in that case; A substrate front face is received in the first source for the vacuum evaporationo for part I of an organic electro luminescent medium. Orientation is carried out at the include angle which puts and sandwiches each wall between said sources and adjacent parts on the front face of a substrate. In that case the amount of [of this organic electro luminescent medium] part I The process selected so that the electroluminescence of the first main hue may be given; A substrate front face, To fields other than the field where the wall is put and inserted between said sources and substrate front faces The process to which the amount of [of an electro luminescent medium] part I is made to adhere alternatively; The second source for the vacuum evaporationo for part II of an organic electro luminescent medium is set on the edge of the pixel nearest to the middle wall in a pixel to a substrate front face. Orientation is carried out at the include angle which puts and sandwiches each wall between the source of this, and the wall in the adjacent part on the front face of a substrate and its nearest middle wall. In that case the amount of [of this organic electro luminescent medium] part II The process selected so that the electroluminescence of the second main hue different from the first main hue may be given; A substrate front face, The amount of [of an electro luminescent medium] part III is made to adhere to the field which has separated each middle wall and ******** nearest to it. In that case the amount of [of this electro luminescent medium] part III The process selected so that the electroluminescence of the third different main hue from each of the first and the second main hue may be given; to a list spacing as 1 set of 3 electrode components opened and arranged in a longitudinal direction Each of an electrode means to join 1 set of files is formed. In that case the second and third electrode components for a start [of each class] The manufacture approach characterized by manufacturing the image display array which has the total color specification engine performance in a substrate front face according to the process which joins the pixel field by which arrangement is carried out soon within the same file rather than any of two parts of the remainder [part / for the first, and the second and part III] respectively of an electro luminescent medium.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to an organic electro luminescent image display device and its manufacture approach.
[0002]
[Description of the Prior Art] Europe ****** The No. 349,265 specification is indicating about an organic electro luminescent image display device and its manufacture approach.
[0003] The above-mentioned Canadian patent application specification is indicated about the substrate which has the anode plate strip of a series of parallel indium stannic acid ghosts which opened spacing in the longitudinal direction and have been arranged. The organic electro luminescent medium has piled up on the anode plate strip. When orientation is perpendicularly carried out to the anode plate strip, and the parallel cathode strip which opened spacing in the longitudinal direction and has been arranged carries out patterning after making a cathode formation metal adhere as a continuation layer, it is formed on the organic electro luminescent medium. Carrying out patterning of the catholyte to a cathode strip is performed by carrying out spin coating of the solution of the monomer nature negative-working photoresist in 2-ethoxyethanol. UV radiation is image Mr. irradiated at the photoresist, a bridge formation pattern is produced, and the photoresist over which a bridge is not constructed is removed by immersing the array for 2 - 3 seconds into 2-ethoxyethanol. A non-irradiated photoresist is removed by this and the field of catholyte is exposed. It removes by immersing an array during the acid etching bath which consists the field of this exposed catholyte of a water:sulfuric-acid solution of 1000:1. After manufacturing a cathode strip with this procedure, the rinse of that array is carried out with water, and it is made to rotate and superfluous moisture is removed.
[0004]
[Problem(s) to be Solved by the Invention] Although the organic electro luminescent equipment currently built in the anode plate and cathode which will stop luminescence if applied voltage is answered, light is emitted and the applied voltage is removed, and where each serves as an integral component can open and close a switch, when it is used independently, it lacks in the image display engine performance. When giving the image display engine performance to organic electro luminescent equipment by making it the parallel strip to which patterning of each of an anode plate and cathode was carried out, and it carried out orientation perpendicularly relatively, the problem that the electrode component piled up on the organic electro luminescent medium must be patternized after the adhesion arises. When this is performed by the conventional wet chemistry patterning technique and the technique which Scozzafava especially illustrates, both the engine performance of image display, and effective actuation both [either or] deteriorate rather than the similar organic electro luminescent equipment which has the cathode and the anode plate of an integral. Degradation of both an organic electro luminescent medium and cathode is accepted.
[0005] The second problem which this invention solves is a problem that only a monochrome image is obtained even if it adopts arrangement of the class which Scozzafava and others is indicating. Pixel which will emit light if it puts in another way (pixel) It is visible [all] to the same hue. Then, image

display is limited to the pattern which can be made without exciting other pixels intentionally at the same time it excites a specific pixel and makes it emit light.
[0006]
[Means for Solving the Problem and its Function] It is related with the luminescence equipment which changes including the image display array in which it sets like 1 voice, and this invention changes from two or more luminescence pixels arranged by 2 sets of crossing parallel files, and the pixel in the first-set parallel file forms a line in, and the pixel in the second-set parallel file forms the train. Each pixel is arranged on the light transmission nature substrate of common electric insulation. Each pixel in the same file of the parallel file of one group contains an electrode means for a start [common / light transmission nature] which is arranged on the substrate, and is joined by it. On the substrate, the first electrode means in the contiguity file of one group opens spacing in a longitudinal direction, and is arranged. The organic electro luminescent medium has piled up on the first electrode means. Each pixel in the same file of the parallel file of the remaining groups contains the common second electrode means arranged on the organic electro luminescent medium, and is joined by it. And on the organic electro luminescent medium, the second electrode means in the contiguity file of the remaining groups opens spacing in a longitudinal direction, and is arranged.
[0007] This luminescence equipment is characterized by a multi-colored picture image display being possible. The organic electro luminescent medium in each pixel At least two secondary pixels which can emit the light of the hue from which each differs (sub-pixel) A field is formed. Each pixel The wall arranged along the boundary which has separated two secondary pixel fields can be contained, the height of the wall can exceed the thickness of an organic electro luminescent medium, and the wall can give shade to the adjoining secondary pixel field. In each file of the pixel of a specific group, either said first electrode means or said second electrode means is divided to the component by which each opened spacing in at least two longitudinal directions which have joined the secondary pixel part of the electro luminescent medium in the same file, and has been arranged.
[0008] In another mode, this invention consists of two or more luminescence pixels arranged by 2 sets of crossing parallel files. The pixel in the parallel file of the first group forms a line, and the pixel in the parallel file of the second group forms a train. Each pixel Each pixel which is arranged on the light transmission nature substrate of common electric insulation, and is in the same file of the parallel file of one group Contain an electrode means for a start [common / light transmission nature] which is arranged on the substrate, and it is joined by it, and the first electrode means in the contiguity file of one group Each pixel which opens spacing in a longitudinal direction on a substrate, and is arranged, and the organic electro luminescent medium has piled up on the first electrode means, and is in the same file of the parallel file of the remaining groups Contain the common second electrode means arranged on the organic electro luminescent medium, and it is joined by it, and the second electrode means in the contiguity file of the remaining groups In the manufacture approach of such luminescence equipment that opens spacing in a longitudinal direction and is arranged on the organic electro luminescent medium (a) The process which offers the substrate with which the first electrode means opens spacing in a longitudinal direction, and is arranged on the front face, (b) — the process and list which make an organic electro luminescent medium adhere to the substrate front face — (c) — it is related with said manufacture approach which grows into the front face of the organic electro luminescent medium including the process which forms the second electrode means.
[0009] This method spacing on the first electrode means opened and arranged in the longitudinal direction on the (i) substrate Before making an organic electro luminescent medium adhere, a substrate front face is received in the first source for the vacuum evaporationo for part I of the process which forms 1 set of parallel walls, and a (ii) organic electro luminescent medium. The process which carries out orientation at the include angle which puts and sandwiches each wall between said sources and adjacent parts on the front face of a substrate (the amount of [of this organic electro luminescent medium] part I) Select so that the electroluminescence of the first hue in a visible spectrum may be given. (iii) To fields other than the field where the wall is put and inserted between said sources and

substrate front faces on the front face of a substrate The process to which the amount of [of an electro luminescent medium] part I is made to adhere alternatively, (iV) to the substrate surface field to which the amount of [on the front face of a substrate / of an electro luminescent medium] part I does not exist The process to which the amount of [of an electro luminescent medium] part II is made to adhere (the amount of [of this electro luminescent medium] part II) the list selected so that the electroluminescence of the second different hue from each of the first hue may be given -- (v) -- at least spacing as an electrode component opened and arranged in the first and the second longitudinal direction The process which forms each of an electrode means to join 1 set of files (the first electrode component in each file) Join the field of the pixel in the same file containing a part for part I of an electro luminescent medium, and the second electrode component in each file It is characterized by manufacturing the image display array which joins the field of the pixel which does not contain a part for part I of an electro luminescent medium and which has the multicolor display engine performance as be alike.

[0010] The advantage of this invention is a point that the operating characteristic which is equal to equivalent organic electro luminescent equipment can be shown except the organic electro luminescent equipment of this invention which has the image display engine performance not having the image display engine performance. The still more important advantage of this invention is a point that the multi-colored picture image display engine performance which does not have equipment of this invention in the organic electro luminescent display of conventional others, for example, Scozzafava's and others equipment quoted previously, is shown.

[0011] The approach of this invention which manufactures the organic electro luminescent equipment for image display offers the advantage of the ability to make both electrodes piled up on an electro luminescent medium and its electro luminescent medium adhere first by the pattern of those requests. So, the fault which accompanies the procedure of removing either an electro luminescent medium or an electrode, and making the pattern of a request of a component forming, and such a procedure is eliminated completely.

[0012] Since it is often less than the order of the micrometer, in order to make it legible, the dimension of an equipment configuration, for example, thickness, sacrifices dimensional accuracy for the scale of a drawing.

[0013] The terminological "electro luminescent" acronym EL is used by the embodiment case. The vocabulary "a pixel" is used in the semantics recognized by the technical field concerned, and means the field of the image display array which is excited independently and can emit light, and ****** as other fields. The vocabulary "multiple color" is used for describing the image display array which can emit the light of a different hue in the field (secondary pixel) to which the same pixels differ. The vocabulary "a total color" is used for the red of a visible spectrum, and describing green and the multi-colored picture image display array which can emit light in a blue field in the field (secondary pixel) to which single pixels differ. The vocabulary "a file" is used in order to show a train or a line. The vocabulary "a hue" means the profile of luminescence of visible-spectrum within the limits on the strength, and a different hue shows the difference of a visually discriminable color.

[0014] Reference of drawing 1 shows some organic electroluminescence equipments 100 which can form a multi-colored picture image. The top face of the desirable transparent electric insulation substrate 101 of the light transmission nature which has the first desirable transparent electrode R1, R2, R3, R4, and R5 of a series of light transmission nature is shown. In the parallel train, for electric insulation, the first electrode opens spacing in a longitudinal direction, and is arranged on the substrate front face. The organic electroluminescence medium EL contacted the whole except the leftmost part of this first electrode, and is piled up on it. On this organic electroluminescence medium, a series of second electrode C1, C2, C3, C4, and C5 arranged in the line which opened spacing in the longitudinal direction mutually and was put in order in parallel has piled up. The second electrode is extended in the longitudinal direction to up to the lower part part of a substrate across the lower part edge of an organic electroluminescence medium. The electrode is divided into the components a and b which opened

spacing in two parallel longitudinal directions, and have been arranged in each line. actual — this equipment — illustrating — reliance — the breadth of a far big field — it can have (in almost all cases, it has again) — for illustrating the vital structures, it comes out enough in the part of the illustrated equipment.

[0015] The broken line of the shape of a crossing grid shown in drawing 1 expresses the boundary of a series of pixels P. The pixel is arranged in the array of 2 sets of crossing files. As the file of one group showed drawing 1 , it is extended horizontally and a train is formed, on the other hand, as the file of the second group showed drawing 1 , it is extended perpendicularly and the line is formed. The train of the lower part in drawing 1 has lapped respectively on one of the first electrode R2, R3, R4, and R5 with which each pixel train which it laps on the first electrode R1, and is followed continues.

[0016] If it progresses to the method of the right from a left in drawing 1 , the pixel of the first line will share similarly the second electrode with which it covers, the second common overlapping electrode C1 is shared, and the pixel of the continuing line continues. It is shown in the field which removed the second electrode which covered the pixel C6 of one certain line, and has lapped, and is made legible. A pixel is further divided to the secondary pixels P1 and P2, and the line C6 has shown. In fact, although the pixel of each line is divided similarly, in order to make it legible, each pixel does not show to a detail so far. On the other hand, the secondary pixel P2 in each line contains b elements which each second electrode covered and have lapped including a elements which each second electrode covered the secondary pixel P1 in each line, and have lapped. The secondary pixels P1 and P2 differ in that a difference is in a hue since they emit the light of a separate wavelength profile on the strength. For example, the secondary pixel P1 can be selected so that light may be emitted mainly in one primary color (namely, blue, green or red), and on the other hand, the secondary pixel P2 can be selected so that light may be emitted in the primary color of one others.

[0017] At the time of actuation, the specific luminescence pattern of the equipment 100 which appears by seeing the base of the transparence substrate 101 is made. In a desirable mode of operation, when the pixel of a single tier is excited at once continuously and the time interval of repetitive excitation of each train repeats excitation of an array at the limit of detection of people's eyes, and the rate selected as it had been less than 1/60 second typically, equipment is excited. A watcher catches sight of the image formed of luminescence from all the excited trains, although equipment is emitting [in / no / a moment] light only from one train.

[0018] In order to make a desired image pattern, the address of each components a and b of the second electrode is carried out electrically independently, and, on the other hand, bias of the first electrode R1 is electrically carried out to substrate luminescence. For example, only the luminescent color phase of the secondary pixel P1 is required, only in the line which moreover contains the second electrode C2, C3, and C4, when required, bias of the component a in these lines is carried out to substrate luminescence, bias of the remaining second electrode component is not carried out electrically, or, on the other hand, it gives polar bias contrary to a polarity required for substrate luminescence. Excitation of a pattern new immediately after emitting light by the desired pattern from the pixel train joined with the first electrode R1 is supplied to the second electrode component, and the luminescence pattern of the request from the pixel train which subsequently carried out bias of the first electrode component R2, and it has joined is excited.

[0019] In manufacture of equipment 100, the first process is a process prepared in the top face of a substrate 101 by the pattern which showed the first electrode R1, R2, R3, R4, and R5 to drawing 1 . The most ordinary selection is the glass substrate which coated the indium stannic acid ghost. The first electrode of a desired pattern is obtained by, etching the field of the indium stannic acid ghost which is not protected with a hydroiodic acid subsequently to patterning of a photoresist, and removing and carrying out the rinse of the photoresist after that. The first electrode component can be manufactured by the light transmission nature thin layer of one metal of the high (for example, higher than 4.0 eV) work functions instead of using an indium stannic acid ghost, tin oxide, or the similar transparent conductive oxide. The mixture of chromium and gold is meant by especially manufacture of this first

electrode. The chemical stability of a substrate and the first electrode is high, and photolithography can be given to those front faces at the continuing processing process, without being accompanied by degradation.

[0020] The processing process which equipment 100 follows is shown in drawing 2 – drawing 4 . A series of first walls 103 for forming the boundary of an parallel pixel line are made to form in the top face of a substrate and the first electrode. These drawings have shown the wall in the cross section of the first electrode R1. In an easy and especially desirable technique, a wall 103 is formed in an adhesion side by carrying out spin coating of the negative–working photoresist. If it is a request, photoresist layer thickness can be made to increase repeatedly, after drying the spin coating process. While constructing a bridge and making the photoresist of an exposure field into an insoluble form by patternized exposure, an unexposed field is removable with development and washing technique. Bridge formation by exposure makes a strong and comparatively hard wall.

[0021] Much wall formation techniques which become instead of are possible. Instead of building a thick photoresist layer according to a continuous spin coating process, a thicker photoresist layer can be made to form on a substrate by carrying out the laminating of the photoresist coating on an elasticity base material like a bright film to a back face. In this mode, it is typical that that photoresist is the monomer which carries out a polymerization by image Mr. exposure after a laminating. If a film is removed after image Mr. exposure, the monomer in the field which was not exposed will also be removed.

[0022] In another wall formation technique, although a photoresist does not form a wall, it demarcates the pattern of a wall by existing in the field which surrounds the wall of a back face. Although formation of a photoresist layer can also take which thing of the above–mentioned mode, image Mr. exposure is selected so that a photoresist may be made to remain to the field which surrounds a wall. a positive –– or negative –– which working photoresist may be used. Then, wall formation ingredients, such as a silica, silicon nitride, and an alumina, are made to adhere to homogeneity so that it may lap on the existing photoresist, and are made to adhere to the adhesion side in a wall field. After a wall is formed, therefore, a photoresist is removable to a certain convenient conventional technique, for example, solvent lift off.

[0023] After making a first wall 103 form in the line boundary of a pixel field, 1 set of second parallel walls 105 are made to form on the boundary which divides each pixel line in the center to a secondary pixel. Since the height of the second wall is lower than a first wall, the second wall is formed in order of another processing before formation of a first wall, and after formation. It can adjust and any one of the above–mentioned techniques for forming a first wall can be adopted so that the height of a wall may be changed, and the second wall can be made to form. As for the second wall, it is desirable to form by single spin casting of negative–working photoresist.

[0024] It becomes possible to make it form by the pattern of a request of the organic electroluminescence medium and the second electrode component part of equipment, without needing the wet chemical treatment for removing an ingredient, and degrading the effectiveness and/or stability of equipment, if a wall is arranged in a right location. The purpose of the first patterning is making the organic electroluminescence medium of the part which bears the first hue of luminescence on the first electrode in a P1 secondary pixel field adhere. This is performed by carrying out the gaseous–phase deposition of the organic electroluminescence medium ingredient from the direction shown with the arrow head 107. In order to complete the illustrated adhesion, orientation of the substrate front face is carried out to the source of an organic electroluminescence medium (with no illustration), and a wall 103 is put and inserted between the source of this, and the first electrode section in the secondary pixel P2. The service area 109 of the adhering organic electroluminescence medium laps on the first electrode in the secondary pixel P1. It does not contribute to luminescence and the organic electroluminescence medium adhering to the side face of a wall is inactive.

[0025] Any convenient conventional directivity (Rhine in drawing) adhesion technique is employable. Adhesion is maintained by the approach it to have been desirable to have conveyed an organic medium by the gaseous phase according to the reduced pressure ambient atmosphere to which the mean free path of a gaseous–phase atom is made to increase, and have suppressed dispersion therefore to the

minimum, and have controlled directivity. generally, spacing of a source and an expected adhesion side is smaller than the mean free path of an organic electroluminescence medium molecule (smaller [until / Namely, / it collides with gaseous-phase molecule with an another organic electroluminescence medium molecule] than average migration length) — like — adhesion — the perimeter ambient pressure force in process is reduced. One gestalt of the molecule beam adhesion, for example, vacuum evaporation technique, electron beam adhering method, or laser ablation method ** is contained in the conventional adhesion technique which suits the requirements for directivity transportation.

[0026] The next process of the processing approach is a process to which the amount of [of the organic electroluminescence medium which bears the second hue of luminescence on the first electrode in a P2 secondary pixel field] part II is made to adhere. The service area 111 for part II of an organic electroluminescence medium is a field of the secondary pixel P2 which has not received a part for part I of an organic electroluminescence medium. Thus, since the pattern of a request of the second hue luminescence is already demarcated by the adhesion for part I of an organic electroluminescence medium, the whole surface can be made for the amount of [of an organic electroluminescence medium] part II to adhere to homogeneity, as the arrow head 113 showed. Adhesion may be performed from a direction perpendicular to a substrate top face, or may be performed in the non-direction format. In the field in which the amount of [of an organic electroluminescence medium] part I lapped on the first electrode, and the amount of [of an organic electroluminescence medium] part II has lapped with the top for this part I, the difference with the hue of luminescence which happens when the hue of luminescence is completely controlled by part for part I of an organic electroluminescence medium and the amount of [of an organic electroluminescence medium] part II does not exist is not significant. The part of the organic electroluminescence medium nearest to the first electrode controls the hue of luminescence.

[0027] After making an organic electroluminescence medium adhere, the source of the metal used in order to make the second electrode component adhere is supplied. The second electrode component needs the metal which should be contacted to an organic electroluminescence medium and in which a lower (under 4.0 eV) work function is shown for efficient organic electroluminescence equipment. One or more sorts of low work function metals combined with independent or one or more sorts of higher work function metals can be made to adhere on an organic electroluminescence medium by any conventional directivity (Rhine in drawing) transportation technique. In order to carry out linearity transportation from a source certainly to an organic electroluminescence medium front face, a metal atom is preferably conveyed under reduced pressure. The consideration same generally as what indicated directivity adhesion of an organic electroluminescence medium previously is made. Any convenient conventional adhesion technique is employable. Directivity adhesion of the metal can be carried out by the ion beam adhering method or the sputtering method other than the adhesion technique previously described in relation to directivity adhesion of an organic electroluminescence medium. In drawing 4 , an arrow head 115 shows directivity adhesion of a metal.

[0028] spacing was opened in the longitudinal direction shown in drawing 1 , and it has been arranged — an opposite — in order to attain the adhesion pattern of the second electrode component in a and b, a substrate front face is arranged to the source of the metal which should adhere, and each wall is put and inserted between the source of this, and the adjacent part of the front face of an organic electroluminescence medium. If it adheres by such orientation, the metal which the part of the wall put and inserted moves from a source will be interrupted, and, therefore, the metal adhesion on the organic electroluminescence medium of one side of each wall will be blocked. Spacing between the second electrode components of ****** is prepared by this.

[0029] Include angle theta 2 adopted in order to make a metal adhere Include angle theta 1 adopted in order to make an organic electroluminescence medium adhere Please pay your attention to a remarkably small thing. include angle theta 1 it selects so that shade may be certainly given to the whole width of face of a secondary pixel — having — on the other hand — include angle theta 2 the electric insulation of the longitudinal direction of the second electrode component of ****** — attaining — the need — it

is an enough small include angle.
[0030] It being independent or making a low (<4.0 eV) work function metal adhere in combination with one or more sorts of high work function metals makes the continuation layer containing a low work function metal adhere, and it only requires that electron injection effectiveness to an organic electroluminescence medium should be made into max. However, offering a continuation layer is expected. 200–500 It is desirable to make the thickness of the second electrode increase exceeding the thickness level which is angstrom. Although the thick electrode beyond it can be made to form to 1 micrometer using the first metal presentation, generally it is desirable to change a presentation so that only the metal of a comparatively high work function (chemical reactivity becomes lower in this way) may be made to adhere after initial formation of the continuation layer containing a low work function metal. For example, probably, it will be desirable to make the thickness of the initial continuation layer of magnesium (desirable low work function metal) and silver, an indium, or aluminum increase, in order to reduce resistance of the second electrode component by making the convenient high work function metal ordinarily used for circuit manufacture, for example, gold, silver, copper, and/or aluminum adhere. Especially the combination of the low work function metal in the interface of an organic electroluminescence medium and the high work function metal which has completed the thickness of the overlapping second electrode component is advantageous. It is because existence of a high work function metal raises the stability of the second electrode component at the same time high electron injection effectiveness produced with a low work function metal is fully realized, although the low work function metal is restricted to the second electrode component interface with an organic electroluminescence medium. Thus, the combination of high injection efficiency and high electrode component stability is realized by this arrangement.
[0031] The organic electroluminescence medium is indicated by the simplest possible mode by old description. That is, which various gestalten of the former used for the amount of [a part for part I 109 of an organic electroluminescence medium and / 111] part II building the conventional equipment containing a single organic electroluminescence medium layer can also be taken. When the organic electroluminescence medium in each activity secondary pixel field contains the layer on which it was superimposed, still more efficient actuation is realized. A hole injection and a transportation band are covered with efficient conventional multilayer organic electroluminescence equipment on a hole–injection electrode, electron injection and a transportation band are covered with it on it in order, and the electron injection electrode is further covered with it on it. In order to raise effectiveness more, a hole injection and a transportation band can be further divided into the hole–injection layer in contact with a hole–injection electrode, and the electron hole transportation layer piled up on the hole–injection layer secondarily. Electron injection and a transportation band contain the luminous layer in contact with a hole injection and a transportation band. In at least 1 set of secondary pixels, a luminous layer can form electron injection and the whole transportation band. In another secondary pixel field, the ingredient which forms the luminous layer in the secondary pixel of the next group has lapped on the layer currently formed by another luminescent material. It dissociates from the hole injection and the transportation band, and since the overlapping ingredient does not receive an electron hole directly, it is not contributed to luminescence. A more efficient electronic transportability ingredient can be covered with still more nearly another transformation on the ingredient which forms a part for the light–emitting part of electron injection and a transportation band. Thus, usually with the still higher organic electroluminescence equipment of such effectiveness, the organic electroluminescence medium of the array of two–layer, three layers, four layers, or much more layers exists.
[0032] In case such a conventional organic electroluminescence medium layer array is applied to operation of this invention, each class of others except one layer to which luminescence takes place can be made to adhere to homogeneity. For example, in order to build the organic electroluminescence equipment which has a hole injection and a transportation band in the lower part of a luminous layer, the organic electroluminescence medium which forms a hole injection and a transportation band is made to adhere to homogeneity first on the first electrode R1 by non–directivity adhesion or perpendicular

adhesion (the direction of an arrow head 113). Subsequently, the amount of [a part for part I 109 of an organic electroluminescence medium and / 111] part II is made to adhere on the hole injection adhering to the homogeneity, and a transportation band, as shown in drawing 2 and drawing 3 . Although luminescence from which two sorts of hues differ takes place from a part for a part for this part I, and part II still more, the effectiveness of equipment improves by existence of the hole injection inserted between the first electrode and parts 109 and 111 and a transportation band. Before adhering the second electrode components a and b, by covering an electron injection layer to homogeneity on the activity parts 109 and 111, organic electroluminescence equipment is further improvable.

[0033] Even when an organic electroluminescence medium is formed in the layer on which it was superimposed and still higher effectiveness is realized, in all cases, less than 1 micrometer of thickness of an organic electroluminescence medium is less than 5000A more typically. While each layer of an organic electroluminescence medium shows about 50A thinness, it can attain sufficient equipment engine performance. Generally, each layer of an organic electroluminescence medium The thickness of the range which is 100–2000A is shown, and it is desirable that the thickness of the whole organic electroluminescence medium is moreover at least 1000A.

[0034] the height in which walls 103 and 105 exceed the thickness of each and the whole organic electroluminescence medium — **** — it is. The only function of a wall 105 is offering separation of the longitudinal direction of the second electrode components a and b. So, the height of a wall 105 is usually selected so that it may become the minimum value convenient for the wall formation technique to adopt. The convenient height for the wall 105 formed with spin on the photoresist paint film is in the range of 1–10 micrometers typically, and is 2 to 20 times the total thickness of an organic electroluminescence medium typically. Spacing of these electrodes that separate the second electrode components a and b certainly electrically in accordance with a wall 105 is theta 2 with desirable it being in the range of 5 – 20 degrees. It can attain by adopting an addressing angle. theta 2 of a bigger value Although positive spacing is offered, generally it is not desirable. It is because the activity luminescence fields inside each pixel decrease in number even to extent to which spacing between the second electrode components a and b of ****** inside the same pixel becomes larger than the minimum spacing required for electric insulation.

[0035] The desirable height of a wall 103 is decided by the include angle theta 1 adopted as directivity adhesion of an organic electroluminescence medium, and width of face of a secondary pixel. Generally this invention is applicable to formation of each pixel in the conventional number and conventional dimension of the range. Bigger cautions are so required for the construction that the marginal length of a pixel is small. Entire fringe length in detailed image formation A pixel 400 micrometers or less is meant. secondary pixel width of face desirable for detailed image formation, and the range of 200–20 micrometers — most — desirable — It is in the range of 100–25 micrometers. Directivity adhesion of the organic electroluminescence medium for demarcating a secondary pixel field is theta 1 of 30 – 60 degrees most preferably 10 to 70 degrees. Generally it can perform about an angle. theta 1 When it is 45 degrees, the height of a wall 103 becomes equal to the width of face of a secondary pixel. theta 1 When it is 60 degrees, the height of a wall 103 is width of face. In order to manufacture a 200–micrometer secondary pixel It is required only for a few to exceed 100 micrometers. Height of a wall 103 Generally restricting to 150 micrometers or less is desirable.

[0036] Walls 103 and 105 can be formed by the width of face of the convenient arbitration for those formation. Making the ratio of the height opposite width of face of a wall into the range of 5:1–1:1 is attained easily, and, generally it is desirable. The thing of a total pixel area for which at least 50% is occupied the optimal is meant for the activity (namely, luminescence) part of each pixel at least 25%. One edge About a bigger pixel than 400 micrometers, occupying the significant fraction of all pixel fields does not have the width of face of a wall rash.

[0037] Although the multi–colored picture image display 100 fully satisfies the requirements for this invention, this equipment has some faults. If drawing 1 is referred to in the first place, in case bias of each electrode will be continuously carried out to it, it is clear to each of the pixel within the same train

in which it emits light that a current must be carried. Thus, in case the current carried with each first electrode excites the pixel of the single tier which emits light, it serves as the sum total of a current carried by each of the second electrode component. The fault of this arrangement is a point that it must be restricted in order that it may be light transmission nature and those thickness may hold this property to luminescence as which the first electrode should be regarded. However, restricting the thickness of an electrode will also restrict conductivity to coincidence.

[0038] When carrying out the address of the pixel continuously not in a train but in a line, each of the second electrode components a and b must carry the current which are all the pixels in the same line. Although the thickness of the second electrode component could exceed it of the first electrode and it has usually exceeded, the width of face of the second electrode component must be narrower than the width of face of a secondary pixel. Consequently, the conductivity of the second electrode component will also be restricted. Furthermore, it is not desirable to carry out the 1 Koichi line address of the pixel. It is because each line contains the two second electrode components, so the addressing rate of a line must be that [twice] of a train in the array which has the pixel of the same number in a row and column. Since time amount which can carry out bias of the secondary pixel in a line is made into one half in order to make light emit, bias voltage is increased rather than train addressing, and the coulomb level and luminescence level of a secondary pixel equivalent to being obtained by addressing of a single-tier single tier at the time of bias must be maintained. Doubling to increase bias voltage and an addressing rate, in order to acquire an equivalent luminescence property means a serious fault.

[0039] Another fault of equipment 100 is a point that the walls 103 and 105 with which height is different must be formed at a separate process.

[0040] While the multicolor organic electroluminescence image display device 200 shown in drawing 5 shows all the image formation engine performance of equipment 100, it solves the above-mentioned fault. If what is described specially is removed, since the description of equipment 200 can also take which mode indicated in relation to equipment 100, explanation is not required further.

[0041] The first electrode C10, C11, C12, C13, C14, C15, C16, and C17 of equipment 200 is divided into Components c and d, respectively. Before the first electrode components c and d show the light transmission nature of the first electrode of equipment 100 and make an organic electroluminescence medium adhere like the first electrode of equipment 100, they are arranged on the substrate 101. A part of secondary pixel P1 in the same line was formed, and these were joined, and, on the other hand, each first electrode component d formed a part of secondary pixel P2 in the same line, and each first electrode component c has joined these. The second electrode R10, R11, and R12 is built with the same ingredient as the second electrode component of equipment 100, and although it can be the same thickness, it is arranged not in a line but in the train. By arrangement of a train, the second electrode can be made broader than the second electrode of equipment 100.

[0042] The electrode electric conductivity which the electrode disposition of equipment 200 attains becomes higher than a thing realizable in equipment 100. In case the address of the pixel of a single tier is carried out, bias of each of the first electrode components c and d is carried out independently, and the luminescence pattern of the request from the pixel in a single tier is attained. Bias of one of the second electrode is carried out to coincidence, and luminescence within the selected train is excited. Each first electrode component excites only one secondary pixel, and carries only the current of one secondary pixel. The second electrode within the selected train carries the current of all the secondary pixels excited in order to have made light emit within the train. Since the second electrode does not need to be light transmission nature and it can be made thickly and broader than the first electrode component, it can make electric conductivity of the electrode of equipment 200 higher than that of the electrode of equipment 100. The advantage of such electric conductivity is realized in equipment 200, without being based on the scan method for every party which requires the twice as many scan speed described in relation to equipment 100 as this.

[0043] One construction of the pixel P of equipment 200 is shown in drawing 6 , and 7 and 8. The wall 205 is arranged along the boundary of the pixel in ********, and each wall is shared by the whole single

tier. The wall 203 is arranged among the first electrode components c and d of a ****** pixel on the boundary of the line of each pixel. From one ******** 205, a wall 203 separates a short distance or a short opening G1, is arranged, and from remaining ******** 205, separates a long distance or a long opening G2 intentionally, and is arranged.

[0044] A wall 203 demonstrates the same function as a wall 103 on the occasion of adhesion of an organic electroluminescence medium. In case the same procedure mentioned above in relation to a part for part I 109 is adopted and the amount of [of an organic electroluminescence medium / 209] part I is made to adhere, adhesion takes place in all the pixel fields except field P2A which is the active region of the secondary pixel P2. The amount of [of an organic electroluminescence medium / 211] part II is made to adhere like a part for part II 111. For simplification, it adheres on a wall and the embodiment indicated later here does not show the organic electroluminescence medium part which therefore does not demonstrate an effective function.

[0045] Please note that active-region P2A of the secondary pixel P2 is smaller than the thing in equipment 100 a little. It is because it has left the field in which spacing between the walls in the boundary of **, a train, and a line has the width of face of the openings G1 and G2 which cannot eliminate a part for part I 209 of an organic electroluminescence medium in secondary pixel P2 field. After forming the first electrode component on a substrate, and before forming a wall in order to prevent the electroluminescence which is not desirable as for the hue for part I of the organic electroluminescence medium in the field of an opening G2, the insulating pad 207 is formed in an opening field. The insulating pad may be made to form by which the convenient insulating layer. Less than 1 micrometer of thickness of an insulating pad is less than 5000A most preferably. Although which a convenient insulating ingredient may be used in order to form an insulating pad, for this purpose, a silica is an ideal insulating material. Patterning of an insulating pad can be performed with the desirable conventional photolithography by one of convenient techniques. As illustrated, each insulating pad has been arranged on the boundary of the pixel of ********, and has spread over the adjoining field of an opening G1, one of the walls 205, and an opening G2. In fact, in order to prevent the electroluminescence which is not desirable, it is required for an insulating pad to occupy only the field of an opening G2, and, moreover, this is only in the field of the secondary pixel P2. However, it is easier to build an insulating pad as a continuation strip over both secondary pixels P1 and P2. If the secondary pixel P1 is crossed, each active regions of these secondary pixels will decrease in number to field P2A. In this way, the active region of a secondary pixel becomes equal and balance is maintained.

[0046] As illustrated, when it builds, it is desirable to introduce an insulating pad into equipment 200. However, an insulating pad is not required. Even when an insulating pad does not exist in the field of an opening G2, spacing of the lengthwise direction between the second electrode which has lapped the first electrode component and on it is increased by existence of both organic electroluminescence medium parts 209 and 211 as compared with the activity secondary pixel field. The inter-electrode potential gradient in these fields will be reduced by this, and, as a result, an electroluminescence will decrease by it. In this way, although some shift by luminescence which is not desirable from an opening G2 as for the luminescent color phase from the secondary pixel P2, still in addition, the severity of a demand can approve for few image formation applications.

[0047] The second electrode R11 which has joined the ****** pixel within the same train is shown by drawing 7 . Please note that there is no wall equivalent to the wall 105 shown by drawing 2 . The function of the wall 105 in equipment 100 is demonstrated with a wall 205, and is clear from drawing 8 . As the arrow head 215 showed, directivity adhesion of the metal which forms the second electrode R11 is carried out at an include angle theta 3. Since the height of a wall 205 is equal to the height of a wall 103, the height of a wall 205 is larger than the height of a wall 105, and it is an include angle theta 3. Include angle theta 2 It is small for whether it is equal or it stretching. theta 3 Generally it is desirable that an include angle is at least 5 times.

[0048] Covering the overall length of each train, from the second electrode of ******, each second electrode will open spacing in a longitudinal direction, and will be arranged by the opening G1 between

the walls in the boundary of a line and a train. Since an opening G2 offers the crossover boundary which does not include a wall between the pixels within the same train, it can be crossed with the second electrode and its certainty of electrical continuity improves. Since the metal which has lapped on the wall has the small radius of curvature of the edge of a wall, it is easy to offer local electric discontinuity. However, when the electric continuity of the metal which has lapped on the wall comes out enough for the specific second electrode configuration and a certain thing is understood, an opening G2 can be excepted completely and the insulating pad 207 can be excepted in order. The active region of a secondary pixel increases by this. It makes it possible to also make the wall 203 and wall 205 in each pixel field which will be separated by the opening G2 cross again. This has the effectiveness of reducing the danger of supporting a wall in a longitudinal direction and doing damage careless in a wall during processing.

[0049] The remarkable advantage about construction of equipment 200 is a point that all walls can be made into the thing of the same height, and can therefore be processed into coincidence. This facilitates processing.

[0050] The multicolor organic electroluminescence image display devices 100 and 200 can contain the combination of various kinds of image colors. In each pixel, only the secondary pixel of :(a) first in which the following combination is possible emits the light of the first hue.;

(b) Only the second secondary pixel emits the light of another hue.;

(c) The secondary pixel of the first and the second both emits the light which makes the consciousness which an eye is mixed and is visible to the third hue.;

(d) Make the black background for luminescence in other pixels, without neither of the secondary pixels emitting light.

In this way, various image hues are possible using the secondary pixel to which only two sorts of hues can emit light.

[0051] Nevertheless, the multicolor equipments 100 and 200 lack in the engine performance which displays the image of the combination of the hue of all the range that can recognize human being's eyes. In order to obtain the total color image display engine performance, it is necessary to divide each pixel into at least three secondary pixels to which each can emit light in the color according to individual of the three primary colors of additive mixture of colors. With blue, and a colors [green and 1 set of three red colors] luminescence primary color is most ordinarily used for all color image display.

[0052] The multicolor organic electroluminescence image display devices 300 and 400 illustrate the equipment configuration by this invention which has the total color image display engine performance. With the equipments 100 and 200 which showed the equipments 300 and 400 shown in drawing 9 and drawing 15 to drawing 1 and drawing 5 , respectively, although it is essentially the same, each pixel P is secondarily divided into three secondary pixels P1, P2, and P3, and the each can emit light with the blue of a spectrum, and green and the peak wavelength in one from which a red part differs. Since each pixel is secondarily divided into three secondary pixels instead of two, the two second electrode components a and b in equipment 100 have been replaced with the three second electrode components e, f, and g with equipment 300. Similarly, the first electrode components c and d in equipment 200 are replaced with the three first electrode components h, i, and j with equipment 400.

[0053] Construction of equipment 300 is the same as that of what was adopted about construction of equipment 100 except for what is described specially. Manufacture of equipment 300 is illustrated by drawing 10 – drawing 14 . Walls 303a and 303b can be the same as a wall 103. Wall 303a is arranged like the wall 103 on the boundary of a ****** pixel. Wall 303b is arranged on the secondary pixel boundary of P2 and P3. The wall 305 is similar with the wall 105, and is arranged on the boundary where the secondary pixels P1 and P2 were shared.

[0054] Include angle theta 1 in the direction shown by arrow-head 307a when making the amount of [of an organic electroluminescence medium / 309] part [adhere in the first secondary pixel field P1 and piling it up on the first electrode R1 It is made to adhere. Although Walls 303a and 303b block adhesion of a up to [the first electrode in the second and third secondary pixel fields], the lower wall 305 should

note enabling adhesion of the organic electroluminescence medium in the first secondary pixel field of the request for part I. This adhesion pattern is shown in drawing 11 .
[0055] When drawing 12 is referred to, it is only the include angle of directivity adhesion so that it may be shown by arrow-head 307b -theta1 The amount of [of the organic electroluminescence medium which bears the second luminescence primary color / 311] part II is made to adhere alternatively in the second secondary pixel P2 by carrying out reversely.
[0056] If drawing 13 is referred to, the amount of [of the organic electroluminescence medium which bears the third luminescence primary color / 312] part III is made to adhere to homogeneity, as shown by the arrow head 313. Although the amount of [of an organic electroluminescence medium] part III has lapped within the first and second secondary pixels on the part to which it adheres before that, there is no effectiveness of changing the luminescent color phase in these fields. Within the third secondary pixel P3, the amount of [312] part III is the luminescent material nearest to the first electrode R1, and the hue of luminescence is controlled.
[0057] Reference of drawing 14 performs formation of the second electrode components e, f, and g which connect the second and third secondary pixels for a start within each line with the same procedure described in relation to drawing 4 . The arrow head 315 shows the direction of adhesion.
[0058] Equipment 300 shows all the advantages of equipment 100, and has the top all color image formation engine performance. blue -- if green and red primary color luminescence are adopted --: (a) in which the combination of luminescence of each pixel to the following is possible --; which the secondary pixel whose number is one is excited [;] and makes blue emit light
(b) One secondary pixel is excited and green is made to emit light.;
(c) One secondary pixel is excited and red is made to emit light.;
(d) Excite two secondary pixels, make blue and green emit light, and make the consciousness of cyanogen.;
(e) Excite two secondary pixels, make blue and red emit light, and make the consciousness of a Magenta.;
(f) Excite two secondary pixels, make green and red emit light, and make the consciousness of yellow.; (g); which excites all secondary pixels and makes white luminescence, and (h) -- dark [without exciting neither of the secondary pixels] -- offer the black background substantially.
[0059] The pixel P of all the color organic electroluminescence medium image display devices 400 is shown in drawing 16 - drawing 18 . A wall 405 is arranged along the boundary of the train of a pixel, and each wall is shared by the pixel of ********. Wall 403a is arranged among the first electrode components h and j of a ****** pixel on the boundary of the line of each pixel. Another new wall 403b is arranged on the boundary of the secondary pixels P2 and P3 in a pixel. Walls 403a and 403b be far apart with distance or an opening G1 short from one ******** 405 -- moreover, be intentionally far apart from remaining ******** 405 with a long distance or a long opening G2 -- it ******.
[0060] In case it is made to adhere with the procedure which used a part for part I 409 of an organic electroluminescence medium for forming parts for part I 109 and 209, adhesion takes place into all the fields of the pixel excluding field P2A and P3A respectively that are active regions of pixels P2 and P3. In the field of openings G1 and G2, the amount of part I laps on the insulating pad 407, and, therefore, it limits the first secondary pixel to active-region P1A. It adheres to parts for the second of an organic electroluminescence medium, and part III 411 and 413 in activity secondary pixel field P2A and P3A, respectively like parts for the second described previously and part III 311 and 312. It is the same as that of what was indicated in relation to equipment 200, and adhesion of the second electrode R11 is the arrow head 415 and the adhesion include angle theta 3 of directivity adhesion. It is shown.
[0061] Equipment 400 has all the advantages of equipment 200, and has the total color image formation engine performance of the upper equipment 300.
[0062] The ingredient of the organic electroluminescence equipment for image display of this invention can also take which mode of conventional organic electroluminescence equipment. For example thing [of Scozzafava quoted previously]; -- United States patent ****** of Tang No. 4,356,429; --

VanSlyke's and others United States patent ****** No. 4,539,507; -- VanSlyke's and others United States patent ****** No. 4,720,432; -- Tang's and others United States patent ****** No. 4,885,211; -- Tang's and others United States patent ****** No. 4,769,292 ;P erry ** -- United States patent ****** No. 4,950,950; -- Littman ** -- United States patent ****** No. 5,059,861; -- United States patent ****** of VanSlyke No. 5,047,687; Scozzafava's and others Canadian patent ****** VanSlyke's and others United States patent application [; of 2,046,439 No.] No. 5,059,862; VanSlyke's and others United States patent ****** It is indicated by No. 5,061,617.

[0063] Especially a desirable substrate is a transparence glass substrate for the equipment of this invention. The first desirable electrode of the equipment of this invention is a transparent indium stannic acid ghost electrode directly covered on the glass substrate.

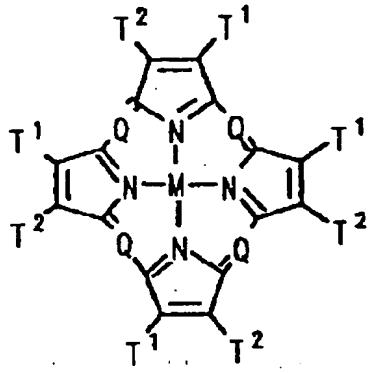
[0064] As for the organic electroluminescence medium covered on the first electrode, it is desirable that it is made of the layer on which it was superimposed in order. It is necessary to make only one or two layers which bear an electroluminescence specially among these layers adhere by the approach which restricted the field as mentioned above. Of course, if it is a request, it will be recognized that the technique mentioned above in order to carry out patterning of the electro luminescent part of an organic electroluminescence medium, and arrangement are employable as the adhesion for a layer of others of an organic electroluminescence medium.

[0065] On the whole field where the organic electroluminescence medium touches the first electrode, it is Adler. United States patent ****** No. 3,935,031 or United States patent ****** of Tang Especially the thing to adhere considering the hole-injection layer which changes including the porphyrin system compound of the type currently indicated by the No. 4,356,429 specification as a homogeneity layer is desirable.

[0066] A desirable porphyrin system compound is : [0067] shown with the following structure expressions (I).

[Formula 1]

(I)

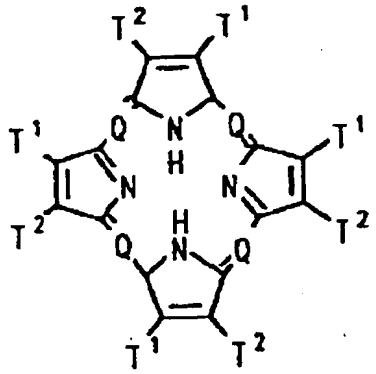


[0068] The inside of an upper type and Q are -N= or -C (R) =,;M is a metal, a metallic oxide, or a metal halogenide,;R is hydrogen, alkyl, an aralkyl, aryl, or Al Khalil, and it is; and T1. And T2 Both the partial saturation six membered rings that express hydrogen or can contain alkyl or a substituent like a halogen are completed. A desirable alkyl part contains 1-6 carbon atoms, and, on the other hand, constitutes an aryl part with desirable phenyl.

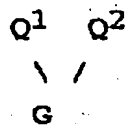
[0069] It is : [0070] which is another compound by which the porphyrin system compound permuted the metal atom of a structure expression (I) from two hydrogen as another desirable mode showed to the structure expression (II).

[Formula 2]

(II)

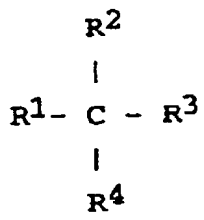


[0071] The very desirable examples of a useful porphyrin system compound are the FURARO cyanine which does not contain a metal, and a phthalocyanine containing a metal. Generally [a porphyrin system compound] it is desirable that a metal has a forward valence number beyond 2 or it although especially a phthalocyanine may contain one of metals. As an example of a desirable metal, cobalt, magnesium, zinc, palladium, and nickel are mentioned, and especially desirable metals are copper, lead, and platinum.
[0072] The following compounds are mentioned as an example of a useful porphyrin system compound :P C-1; porphin PC-2;1, 10, 15, 20 - Tetra-phenyl - 21H, 23H - Porphin copper (II)
PC-3;1, 10, 15, 20 - Tetra-phenyl - 21H, 23H - Porphin zinc (II)
PC-4;5, 10 and 15, and 20- Tetrakis (pentafluorophenyl)-21H and 23H- a porphin PC-5; silicon phthalocyanine -- oxide PC-6; aluminum phthalocyanine chloride PC-7; -- phthalocyanine (metal non-**)
PC-8; -- dilithium -- phthalocyanine PC-9; copper tetramethyl phthalocyanine PC-10; -- copper-phthalocyanine PC-11 --; chromium phthalocyanine fluoride PC-12; zinc phthalocyanine PC- 13; lead phthalocyanine PC-14; titanium phthalocyanine oxide PC -- a -15; magnesium phthalocyanine PC-16; copper octamethyl phthalocyanine [0073] An electron hole transportation layer is made to adhere to homogeneity on a hole-injection layer with the desirable configuration of the equipment by this invention. It is desirable that an electron hole transportation layer contains a kind of electron hole transportability aromatic series tertiary amine at least. It is understood that this tertiary amine is a compound containing at least one trivalent nitrogen atom combined only with the carbon atom (at least one of pieces [them] is ** of a ring). In a certain one mode, an aromatic series tertiary amine can be arylamine, for example, mono-arylamine, diarylamine, a thoria reel amine, or the amount arylamine of macromolecules. the thoria reel amine of an instantiation-monomer -- Klupful ** -- United States patent ****** It is illustrated by the No. 3,180,730 specification. The other suitable thoria reel amines which were permuted by vinyl or the vinylidene radical and which reach and contain/or at least one active hydrogen content radical are Brantley's and others United States patent ******. It is indicated by No. 3,567,450 and the 3,658,520 specification.
[0074] The desirable aromatic series tertiary amine of a class contains at least two aromatic series tertiary-amine parts. In such a compound, it is structure-expression (III): [0075].
[Formula 3]
(III)

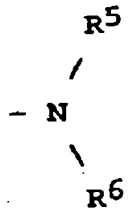


[0076] The compound shown by (Q1 and Q2 are aromatic series tertiary-amine parts independently among an upper type, and G is a joint radical, for example, propine, cyclo alkylene, an alkylene group, or carbon-carbon bonding) is contained.
[0077] Especially the desirable thoria reel amine of a class that fills a structure expression (III) and contains two thoria reel amine parts is structure-expression (IV): [0078].

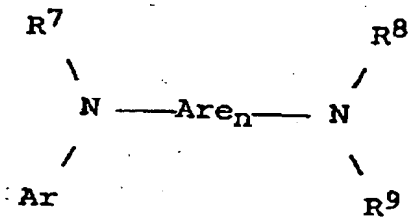
[Formula 4]
(IV)



[0079] (R1 and R2 express a hydrogen atom, an aryl group, or an alkyl group independently among an upper type, respectively, or R1 and R2 express the atom which completes a cycloalkyl radical together, and;, R3, and R4 are structure-expression (V): [0080] independently, respectively.)
[Formula 5]
(V)



[0081] the aryl group permuted in order by the diaryl permutation amino group as shown by (the inside of an upper type, R5, and R6 are specific aryl groups independently) — expressing — it fills.
[0082] The aromatic series tertiary amine of another desirable class is tetra-aryl diamine. Desirable tetra-aryl diamine contains two diaryl amino groups as shown with the structure expression (IV) combined by the propine radical. In desirable tetra-aryl diamine, it is structure-expression (VI): [0083].
[Formula 6]
(VI)



[0084] What is shown by (Are is a propine radical among an upper type, and n is the integer of 1-4, and Ar, R7, R8, and R9 are specific aryl groups independently) is contained.
[0085] The above-mentioned structure expression (III), (IV), (V) and the various alkyls of (VI), alkylene, aryl, and a propine part may be permuted in order respectively. A halogen, for example, a fluoride, a chloride, and a bromide are contained in a typical substituent at an alkyl group, an alkoxy group, an aryl group, an aryloxy group, and a list. Various alkyls and an alkylene part contain 1-5 carbon atoms typically. Although a cycloalkyl part can contain 3-10 carbon atoms, contain 5, 6, or seven ring carbon atoms typically, for example, they are cyclopentyl, cyclohexyl, and a cycloheptyl ring structure. As for aryl and a propine part, it is desirable that they are phenyl and a phenylene part.
[0086] the typical thing of a useful aromatic series tertiary amine — Berwick ** — United States patent ****** It is indicated by No. 4,175,960 and VanSlyke's and others 4,539,507 specification. As a useful electron hole transportability compound, Berwick and others is indicating N-permutation carbazole further. ring bridge formation of diaryl one which indicated N-permutation carbazole previously, and a thoria reel amine — it can see as a variant.
[0087] Canadian patent ****** of VanSlyke and others quoted previously If instruction of a No. 2,046,135 specification is followed, it is possible to attain higher organic EL device stability in the period of both a short period and a long period of time of operation by changing one or more of the aryl group

coupled directly with the third class nitrogen atom in an above-mentioned aromatic series tertiary amine to the aromatic series part containing at least two fused aromatic rings. an aromatic series tertiary amine -- (1) -- at least two tertiary-amine parts -- containing -- changing -- (2) -- when it is what combines with a tertiary-amine part and contains the aromatic series part containing at least two fused aromatic rings, the best combination of short actuation (0 - 50 hours) and both prolonged actuation (0 - 300 hours or more) is attained. [and] Although the fused aromatic ring part of a tertiary amine may contain 24 or more carbon atoms, it contains 10-16 ring carbon atoms preferably. Although it is possible to carry out condensation of partial saturation 5 and the seven membered-rings to a 6 member ring (namely, benzene ring), and to form a useful fused aromatic ring part, generally it is desirable that a fused aromatic ring part contains at least two condensation benzene rings. The easiest gestalt of the fused aromatic ring part containing the two condensation benzene rings is naphthalene. So, a desirable ring part is a naphthalene part. With a naphthalene part, it is understood as what includes all the compounds containing a naphthalene ring structure. In a monovalence form, a naphthalene part is a naphthyl part, and a naphthalene part is a naphthylene part in a bivalence form.

[0088] The example of a useful aromatic series tertiary amine : indicated below -- ATA-1;1 and 1-screw () [4-G p-] Tolylamino phenyl cyclohexane ATA-2;1, 1-screw (4-G p- tolylamino phenyl) phenylcyclohexane ATA-3;4, 4'"-screw (diphenylamino) KUATERU phenyl ATA-4; screw () [4-dimethylamino-2-] - tetra--p- methylphenyl phenylmethane ATA-5; -- N, N, and N-Tori (p-tolyl) amine ATA-6;4-(G p- tolylamino)- 4'-[4-(G p- tolylamino) styryl] stilbene ATA-7; -- N, N, N', and N' -- tolyl - 4 and 4'-diamino biphenyl ATA-8; -- N, N, N', and N' -- the - tetra-phenyl -4 and 4'-diamino biphenyl ATA-9;N-phenyl carbazole ATA-10; Pori (N-vinylcarbazole)
ATA-11;4, 4'-screw [N-(1-naphthyl)-N-phenylamino] biphenyl ATA-12;4, 4"-screw [N-(1-naphthyl)-N-phenylamino]-p-terphenyl ATA-13;4, and 4'- Screw [N-(2-naphthyl)-N-phenylamino] biphenyl ATA-14;4, 4' - Screw [N-(3-ASENAFU thenyl)-N-phenylamino] biphenyl ATA-15;1 and 5-screw [N-(1-naphthyl)-N- Phenylamino] naphthalene ATA-16;4 and 4'- Screw [N-(9-anthryl)-N-phenylamino] biphenyl ATA-17;4, 4" - Screw [N-(1-anthryl)-N-phenylamino]-p - Terphenyl ATA-18;4, 4' - Screw [N-(2-phenan tolyl)-N- Phenylamino] biphenyl ATA-19;4 and 4'- Screw [N-(8-fluoran thenyl)-N- Phenylamino] biphenyl ATA-20;4 and 4'- Screw [N-(2-pyrenyl)-N-phenylamino] biphenyl ATA-21;4, 4'-screw [N-(2-North America Free Trade Agreement SENIRU)-N-phenylamino] biphenyl ATA-22;4, 4' - Screw [N-(2-peri RENIRU)-N- Phenylamino] biphenyl ATA-23;4 and 4'- Screw [N- (1-koro NENIRU)-N - Phenylamino] biphenyl ATA-24;2, 6-screw (G p- tolylamino) naphthalene ATA-25;2, 6-screw [G (1-naphthyl) amino] naphthalene ATA-26;2, and 6-screw [N-(1-naphthyl)-N- (2-naphthyl) Amino] naphthalene ATA-27;4, 4" - Screw [N and N-JI (2-naphthyl) amino] terphenyl ATA-28;4, 4'-screw [N-phenyl-N-[4-(1-naphthyl) phenyl] amino} biphenyl ATA-29;4, and 4'- Screw [N-phenyl-N - () 2-pyrenyl amino] biphenyl ATA-30;2, 6-screw [N and N-JI (2-naphthyl) amino] fluorene ATA-31;4, 4" - Screw (N and N-G p - tolylamino) terphenyl ATA-32; [Screw (N-1-naphthyl)] (N-2-naphthyl) Amine.

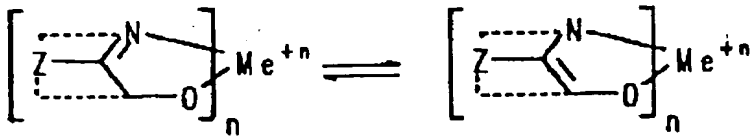
[0089] The luminous layer of equipment has piled up on the electron hole transportation layer. In each pixel, a different luminous layer touches the electron hole transportation layer in the each second pixel. It is required for each hue of desired luminescence to choose a different luminous layer.

[0090] It is desirable that at least one luminous layer uses the metal oxy-NOIDO system charge receptiveness compound which fills the following formulas.

[0091]

[Formula 7]

(VII)



[0092] Me expresses a metal among an upper type, n is the integer of 1-3, and Z expresses an atom required to complete an oxine ring.

[0093] :CO-1; aluminum tris oxine CO-2; magnesium screw oxine CO-3; screw [{Benzo f}-8-quinolate] zinc CO-4 to which the following is mentioned as an example of a useful chelation oxy-NOIDO compound; aluminum tris (5-methyl oxine)
a CO-5; indium tris oxine -- CO-6; lithium oxine CO-7; gallium tris (5-chloro oxine)
CO-8; calcium screw (5-chloro oxine)
CO-9; Pori [zinc (II)-screw (8-hydroxy-5-kino RINIRU) methane]
CO-10; dilithium EPINDORI dione CO-11; aluminum tris (4-methyl oxine)
CO-12; aluminum tris (6-trifluoromethyl oxine).
[0094] The most desirable thing is the tris chelate of aluminum among various kinds of metal oxy-NOIDO. These chelates are generated by making three 8-hydroxyquinoline and one aluminum atom react. The aluminum tris oxine [the alias name and the tris (eight quinolinol) aluminum] and aluminum tris [the alias name and the tris (5-methyl-eight quinolinol) aluminum] (5-methyl oxine) which are a desirable green emitter are especially contained in these chelates.
[0095] United States patent ****** of VanSlyke and others transferred in common in order to build the luminous layer which emits light in the blue part of a spectrum It is desirable to use the mixed ligand aluminum chelate of the type currently indicated by No. 738,777 (name of 1991 January eight-day application and invention "IMPROVED BLUE EMITTING INTERNAL JUNCTION ORGANIC ELECTROLUMINESCENT DEVICE" (III)). In an especially desirable mode, the mixed ligand aluminum chelate currently indicated by this patent contains a screw (RS-8-quinolate) (phenolate) aluminum (III) chelate. Here, it is RS. It is the ring substituent of 8-quinolate ring chosen so that association of 8-quinolate ligand which exceeds two pieces to an aluminum atom might be blocked. These compounds are following formula: [0096].
[Formula 8]
(VIII)

$$(R^S\text{-}Q)_2\text{-}Al\text{-}O\text{-}L$$

[0097] It can express by (8-quinolate ring substituent chosen so that Q might block association of the permutation 8-quinolate ligand to which a permutation 8-quinolate ligand is expressed in each ****, and RS exceeds two to an aluminum atom in three dimensions is expressed among an upper type, and O-L is a phenolate ligand, and L is the hydrocarbon of 6-24 carbon atomic numbers which change including a phenyl part).
[0098] All the desirable physical properties of the tris (8-quinolate) aluminum (III) chelate which is the desirable green luminophore of organic electroluminescence equipment have the advantage which uses the aluminum chelate containing two permutation 8-quinolate ligands and one phenolate ligand in the point of being held even if luminescence moves to the blue field of a spectrum.
[0099] Existence of a phenolate ligand is the cause which moves luminescence to the blue part of a spectrum. The phrase "a phenolate ligand" used on these specifications is used by the nomenclature meaning the ligand combined with aluminum with the hydroxyl which the phenol deprotonated recognized by the technical field concerned.
[0100] In the easiest mode, a phenolate ligand may be offered according to deprotonation of hydroxybenzene. The organic EL device engine performance illustrated that component stability (hold one half exceeding 50 hours even if there is little initial luminescence reinforcement) in short wavelength which can be permitted [which can permit and can maximum-emit light] might be realized rather than 500 nm.
[0101] In the efforts for for an engine-performance improvement, the permutation phenol was examined continuously. It was observed that luminescence reinforcement with comparatively weak methoxy and dimethoxy permutation phenolate ligand is shown. Since the methoxy substituent was electron-donative, the phenol with strong substituent of electronic suction nature, for example, halo, and cyano ** and alpha-halo alkylation radical was also examined. Although aluminum formed these ligands and chelates, luminophore's gaseous-phase conversion did not work.
[0102] It was decided to be the aluminum chelate of Formula VIII that a desirable phenolate ligand was

guided from a HO-L phenol (here, L is the hydrocarbon of 6-24 carbon atomic numbers which change including a phenyl part). This contains not only hydroxybenzene but various kinds of hydrocarbon permutation hydroxybenzene, hydroxy naphthalene, and other condensed-ring hydrocarbons. Since the monomethyl permutation of a phenyl part shortens luminescence wavelength, it is desirable that a phenolate ligand contains at least seven carbon atoms. There is almost no advantage generally acquired using the phenolate ligand which has many carbon atoms very much. However, examination of a phenolate ligand which has 18 ring carbon atoms showed the stability of high level. In this way, it is desirable that a phenolate ligand contains the carbon atom of 7-18 totals.

[0103] It is meant that the aliphatic series substituent of the phenyl part of a phenolate ligand contains 1-12 carbon atoms, respectively. When especially the alkylphenyl partial substituent of 1-3 carbon atomic numbers was desirable and used the methylation radical, it was observed that the whole best property arises.

[0104] As for the aromatic hydrocarbon substituent of a phenyl part, it is desirable that they are phenyl or a naphthyl ring. It was observed that all of the phenyl, the diphenyl, and the triphenyl substituent of a phenyl part produce a very desirable organic EL device property.

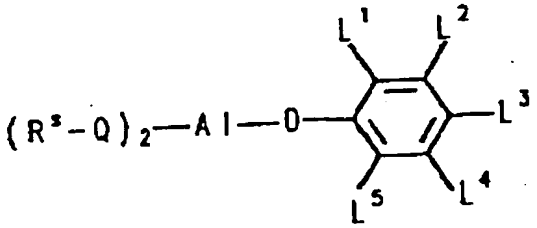
[0105] It was observed that the phenolate ligand of alpha or the beta-naphthol origin produces a very extremely stable aluminum chelate. It was admitted that extent of the luminescence migration to short wavelength was limited more as well as what was shown by the phenolate ligand of the hydroxybenzene origin. Construction of a very desirable component is possible by using a naphth RATO ligand content aluminum chelate combining a luminescent blue fluorochrome so that it may describe below.

[0106] When the alt.** meta and the Para permutation analog of various phenolate ligands were compared, even if there was a difference of the engine performance which the location of the ring of a phenyl part which a hydrocarbon substituent occupies contributes, it turned out that there is almost nothing.

[0107] In a desirable mode, an aluminum chelate is the following formulas and [0108].

[Formula 9]

(IX)



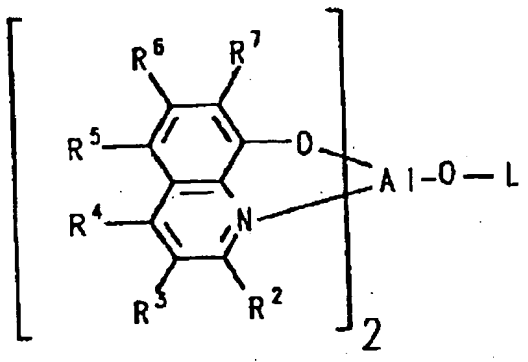
[0109] (Q and RS are as having given the definition previously among an upper type. L1, L2, L3, L4, and L5) collective — 12 or less carbon atoms — containing — moreover — each — becoming independent — the hydrocarbon group of hydrogen or 1-12 carbon atomic numbers — expressing — L1 [however,] L2 together — L2 [or] L3 together — a condensation benzo ring — it can form — it fills.

[0110] Although both 8-quinolate both [one side or] can contain substituents other than a steric hindrance substituent, the further permutation of a ring is not required. It is recognized further that the substituent exceeding a piece per ring piece can contribute to a steric hindrance. It is following formula:

[0111] which can serve as various kinds of steric hindrance substituents.

[Formula 10]

(X)



[0112] It **** most easily by referring to (among an upper type, L can take any above-mentioned mode, and R2 -R7 expresses the replaceable nature in each location of 2-7 of 8-quinolate ring). 4 of a ring, 5, and the substituent in the 6th place are arrangement which is not desirable to blocking in three dimensions that three 8-quinolate rings combine with one aluminum atom. although it is expected that the big substituent in the 3rd place of a ring or the 7th place can offer sufficient steric hindrance — bulk — since installation of a high substituent makes molecular weight increase substantially, without raising the engine performance of a molecule, it reduces the whole engine performance. However, the 2nd place of a ring is suitable for offering steric hindrance, and offers a steric hindrance substituent even with the effective, very small substituent (for example, methyl group) in one of the locations of these rings. Especially the thing for which the steric hindrance substituent is arranged from the convenience on composition at the 2nd place of a ring is desirable. The phrase "a steric hindrance" used on these specifications is used for it being shown that an RS-Q ligand cannot compete to the inclusion as the third ligand of an aluminum atom.

[0113] Although the phenolate ligand mainly bore acquisition of blue luminescence, it was observed that the hue migration operation also with the useful substituent to 8-quinolate ring can be made. A quinoline ring consists of the benzo ring and pyrid ring by which condensation was carried out. If the pyrid ring component of a quinoline ring is permuted by one or more electron-donative substituents, the hue of luminescence will shift from the green field of a spectrum to more nearly main blue luminescence. Although especially the electron-donative substituent in the ortho position and the para position (namely, the 2nd place and the 4th place of a quinoline ring) of a pyrid ring affects the hue of luminescence, on the other hand, the effect which it has on the hue of luminescence has the comparatively small meta position (the 3rd place of a quinoline ring) of a pyrid ring. If it is a request, it is actually accepted in the 3rd place of a ring that an electronic receptiveness substituent can be arranged, making a blue luminescence property hold. It is completely unrelated to electron-donative or electronic receptiveness, and steric hindrance is R2. It is R2 although any mode of a theory top electron releasing group or an electronic receptiveness radical can be taken. Choosing from electron releasing groups is desirable. The second electron releasing group R4 By adding, shifting a hue from the green part of a spectrum further is attained. R3 Although any convenient mode can be taken on composition when making it exist, it is desirable that this is also electron-donative.

[0114] It is common knowledge for this contractor that a specific substituent determines electron-donative or electronic receptiveness. Electron-donative [of the most ordinary substituent of hundreds] or electronic receptiveness reflecting all the substituents of a common category is measured, and a quantum is carried out, and it is indicated by reference. The most ordinary method of quantifying electron-donative and receptiveness is related with the Hammett sigma value. The substituent which shows the negative Hammett sigma value is electron-donative, and the substituent which shows the forward Hammett sigma value conversely is electronic receptiveness. The Hammett sigma value of hydrogen is 0 and other substituents show the Hammett sigma value which increases in the forward direction or the negative direction directly in relation to those electronic receptiveness or supply nature. Lange Handbook of Chemistry, 12th Ed., McGraw Hill, 1979, Table 3-12, and pp.3-134-3-138 The Hammett sigma value to many usual substituents is indicated. Although the Hammett sigma value is

assigned on the basis of the phenyl ring permutation, they provide choosing qualitatively an electron-donative substituent and an electronic receptiveness substituent about a quinoline ring with available guidance.

[0115] It is R2 when all factors, i.e., steric hindrance nature, the convenience on composition and electron-donative, or receptiveness is collectively taken into consideration. It is desirable that they are amino and oxy-** or a hydrocarbon substituent. R2 Even when it is a methyl group and is the only 8-quinolate ring substituent (that is, R3, R4, R5, R6, and R7 are hydrogen respectively), sufficient steric hindrance is offered. In this way, one of amino groups, an oxy-radical, or the hydrocarbon group that has at least one carbon atom is contained in a desirable substituent. Also in which 1 hydrocarbon part, it is desirable that the existing carbon atomic number does not exceed ten pieces, and it is optimal that it does not exceed six pieces. In this way, R2 - It is desirable R' and to take the mode of -OR' or -N(R″) R' (R' is the hydrocarbon of 1-10 carbon atomic numbers among a formula, and R″ is R' or hydrogen). Preferably, it is R2. Six or less carbon atoms are contained in ten or less carbon atoms and optimum.

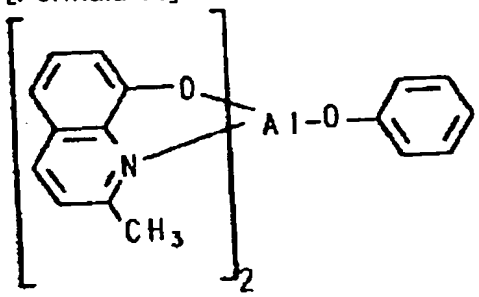
[0116] R3 And R4 By the above-mentioned reason, it is R2. It is R2 although the mode of the large range can be taken. Especially the thing to choose from the same desirable substituent groups is meant. Since it is not required, the permutation of the 3rd place and the 4th place of a ring is R3. And R4 You may be hydrogen further.

[0117] Since it is not required, 5 of a ring, 6, or the permutation of the 7th place is R5, R6, and R7. Hydrogen can be expressed. a desirable mode -- R5, R6, and R7 an electronic receptiveness substituent with sufficient convenience on composition, for example, a cyano ** halogen, and a list -- ten or less alpha-halo alkyl which contains six or less carbon atoms most preferably, alpha-haloalkoxy, an amide, sulfonyls, carbonyls, carbonyloxy, and oxy-carbonyl substituents -- since -- it can choose.

[0118] The following constitutes the special example of the desirable mixed ligand aluminum chelate which satisfies the requirements for this invention :P C-1; screw (2-methyl-8-quinolate) (phenolate) aluminum (III)

[0119]

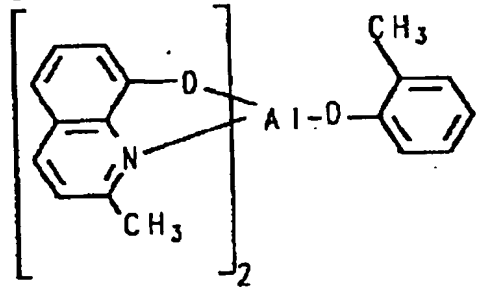
[Formula 11]



[0120] PC-2; screw (2-methyl-8-quinolate) (alt.-cresolate) aluminum (III)

[0121]

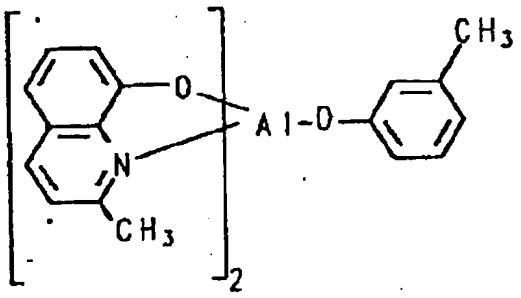
[Formula 12]



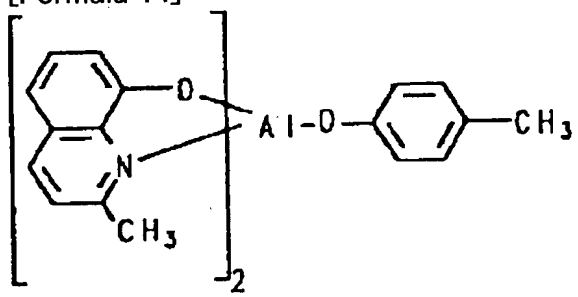
[0122] PC-3; screw (2-methyl-8-quinolate) (meta-cresolate) aluminum (III)

[0123]

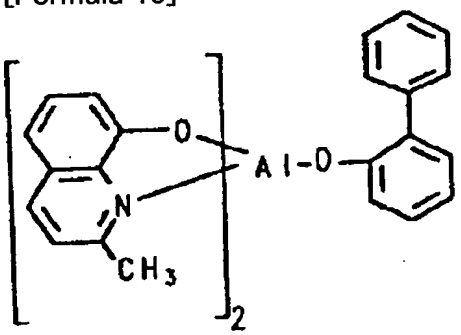
[Formula 13]



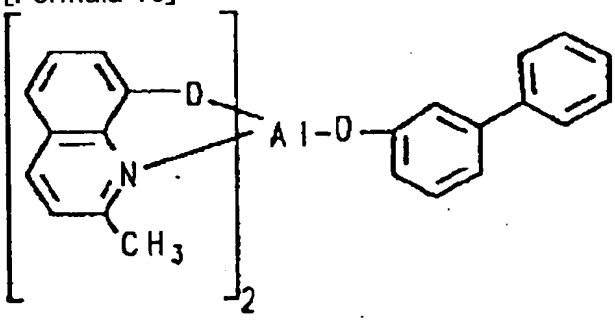
[0124] PC-4; screw (2-methyl-8-quinolate) (Para-cresolate) aluminum (III)
[0125]
[Formula 14]



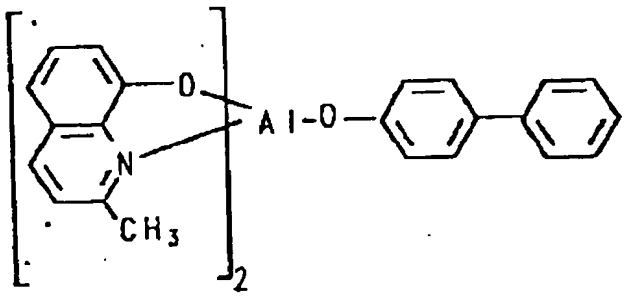
[0126] PC-5; screw (2-methyl-8-quinolate) (alt.-phenyl phenolate) aluminum (III)
[0127]
[Formula 15]



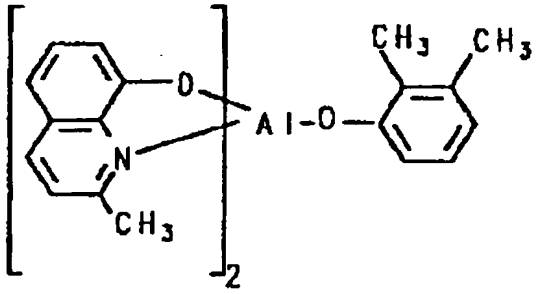
[0128] PC-6; screw (2-methyl-8-quinolate) (meta-phenyl phenolate) aluminum (III)
[0129]
[Formula 16]



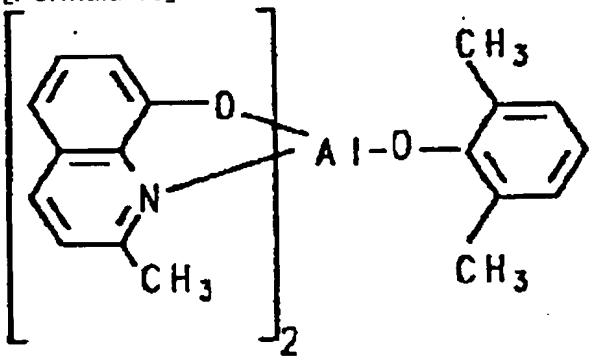
[0130] PC-7; screw (2-methyl-8-quinolate) (Para-phenyl phenolate) aluminum (III)
[0131]
[Formula 17]



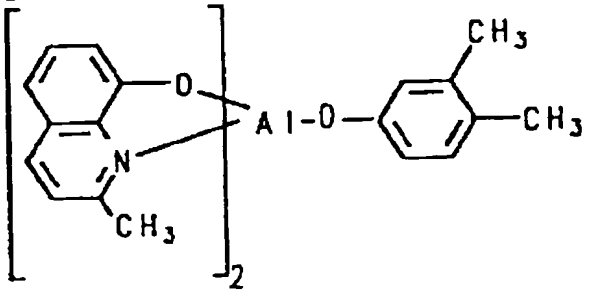
[0132] PC-8; screw (2-methyl-8-quinolate) (2, 3-dimethyl phenolate) aluminum (III)
[0133]
[Formula 18]



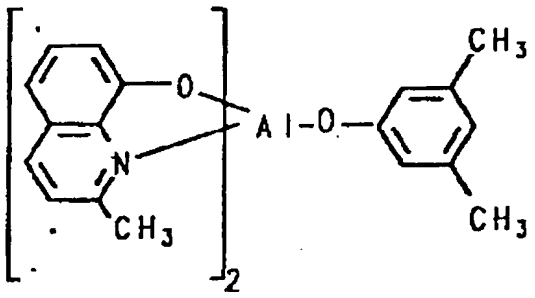
[0134] PC-9; screw (2-methyl-8-quinolate) (2, 6-dimethyl phenolate) aluminum (III)
[0135]
[Formula 19]



[0136] PC-10; screw (2-methyl-8-quinolate) (3, 4-dimethyl phenolate) aluminum (III)
[0137]
[Formula 20]



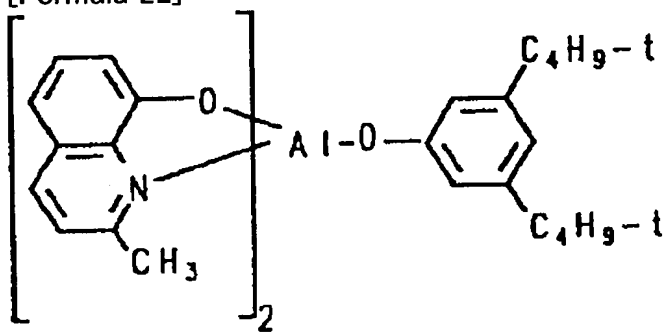
[0138] PC-11; screw (2-methyl-8-quinolate) (3, 5-dimethyl phenolate) aluminum (III)
[0139]
[Formula 21]



[0140] PC-12; screw (2-methyl-8-quinolate) (3, 5-G tert-butyl phenolate) aluminum (III)

[0141]

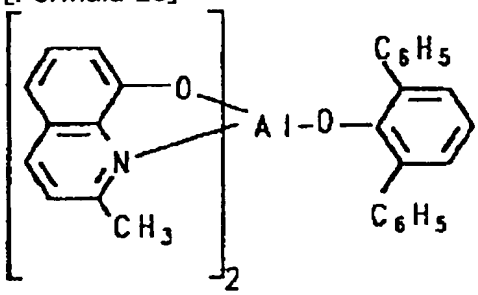
[Formula 22]



[0142] PC-13; screw (2-methyl-8-quinolate) (2, 6-diphenyl phenolate) aluminum (III)

[0143]

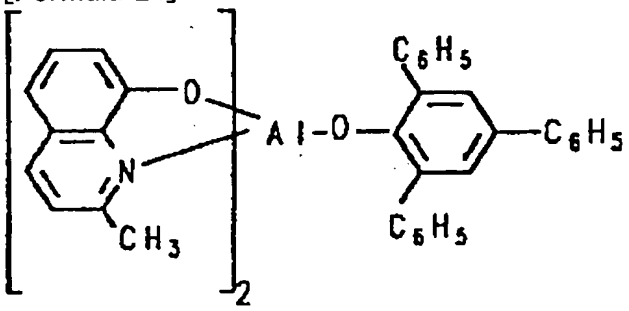
[Formula 23]



[0144] PC-14; screw (2-methyl-8-quinolate) (2, 4, 6-triphenyl phenolate) aluminum (III)

[0145]

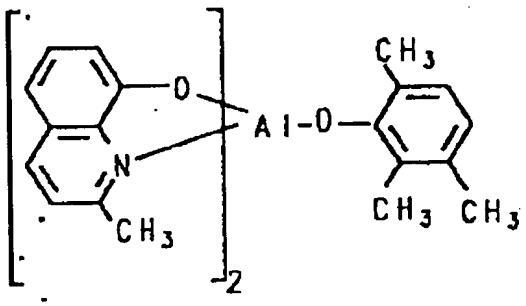
[Formula 24]



[0146] PC-15; screw (2-methyl-8-quinolate) (2, 3, 6-trimethyl phenolate) aluminum (III)

[0147]

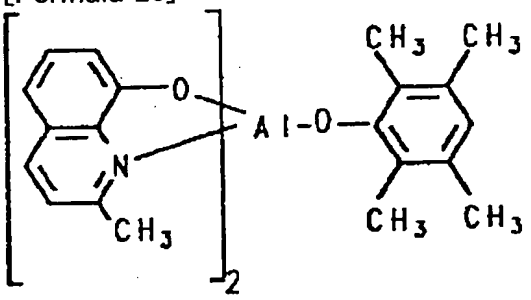
[Formula 25]



[0148] PC-16; screw (2-methyl-8-quinolate) (2, 3, 5, 6-tetramethyl phenolate) aluminum (III)

[0149]

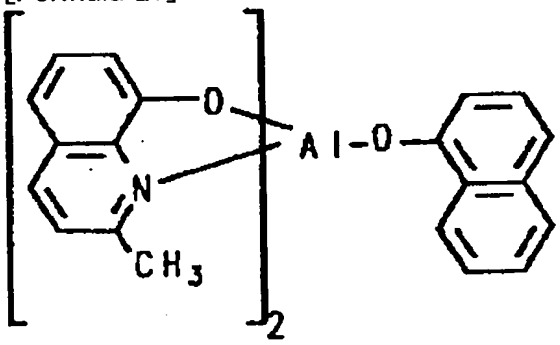
[Formula 26]



[0150] PC-17; screw (2-methyl-8-quinolate) (1-naphth RATO) aluminum (III)

[0151]

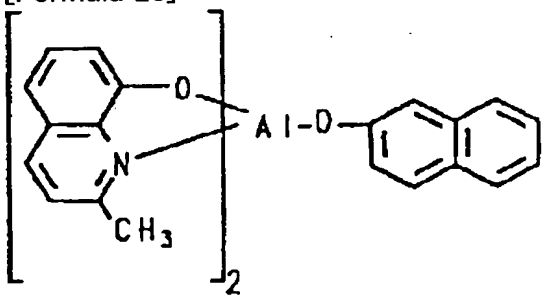
[Formula 27]



[0152] PC-18; screw (2-methyl-8-quinolate) (2-naphth RATO) aluminum (III)

[0153]

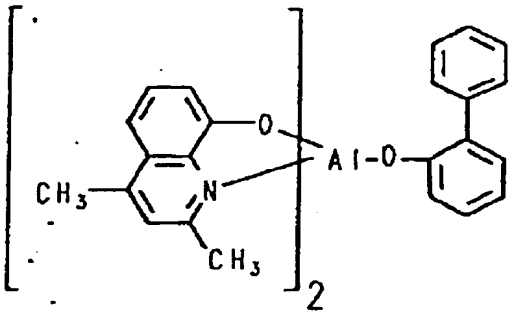
[Formula 28]



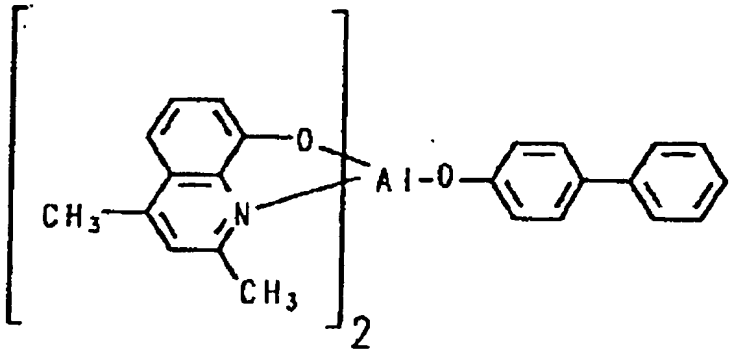
[0154] PC-19; screw (2, 4-dimethyl-8-quinolate) (alt.-phenyl phenolate) aluminum (III)

[0155]

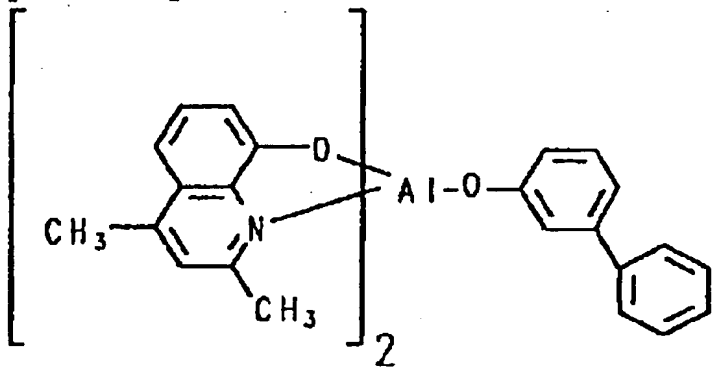
[Formula 29]



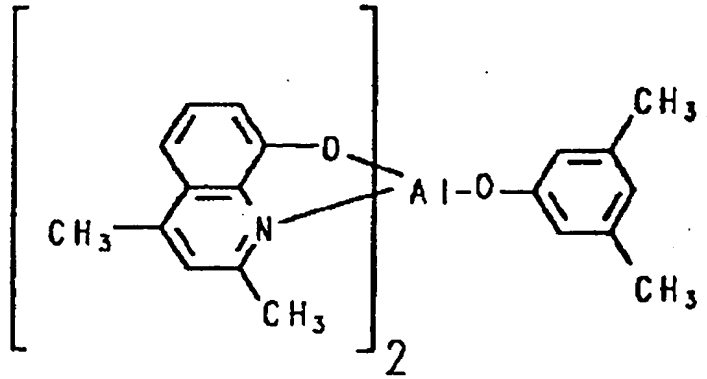
[0156] PC-20; screw (2, 4-dimethyl-8-quinolate) (Para-phenyl phenolate) aluminum (III)
[0157]
[Formula 30]



[0158] PC-21; screw (2, 4-dimethyl-8-quinolate) (meta-phenyl phenolate) aluminum (III)
[0159]
[Formula 31]

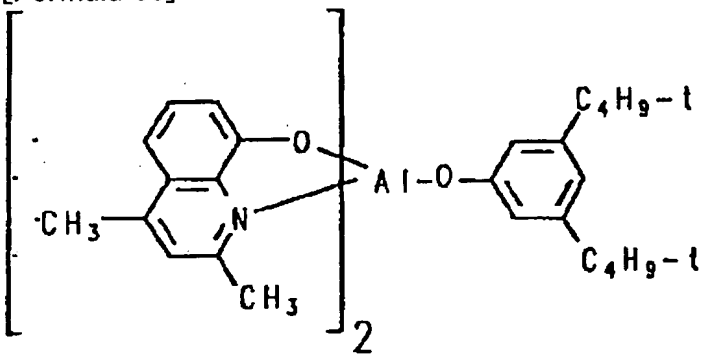


[0160] PC-22; screw (2, 4-dimethyl-8-quinolate) (3, 5-dimethyl phenolate) aluminum (III)
[0161]
[Formula 32]

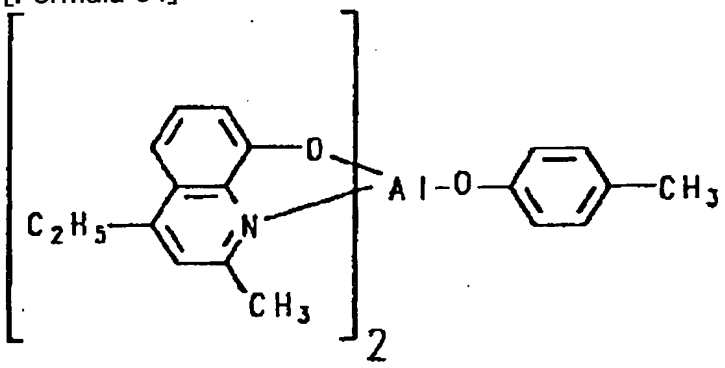


[0162] PC-23; screw (2, 4-dimethyl-8-quinolate) (3, 5-G tert-butyl phenolate) aluminum (III)

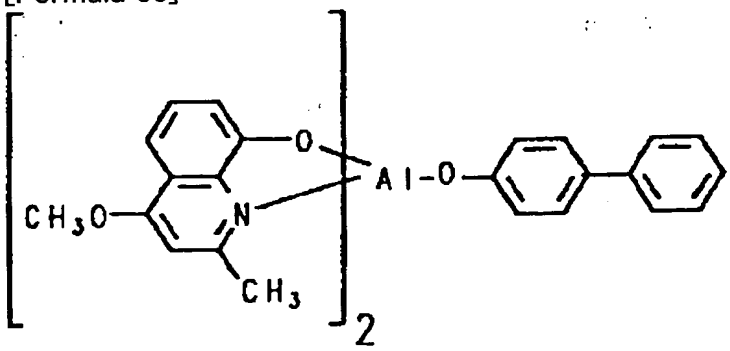
[0163]
[Formula 33]



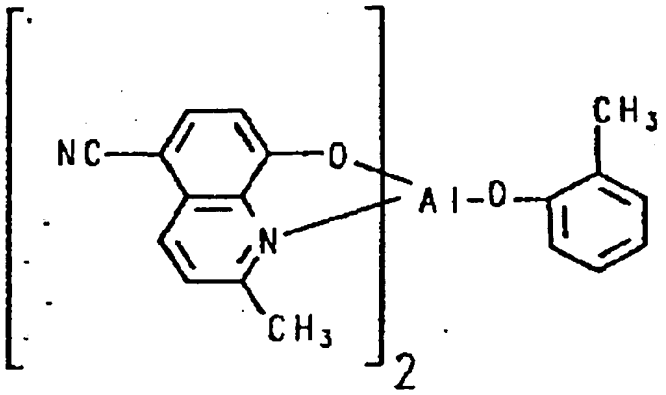
[0164] PC-24; screw (2-methyl-4-ethyl-8-quinolate) (Para-cresolate) aluminum (III)
[0165]
[Formula 34]



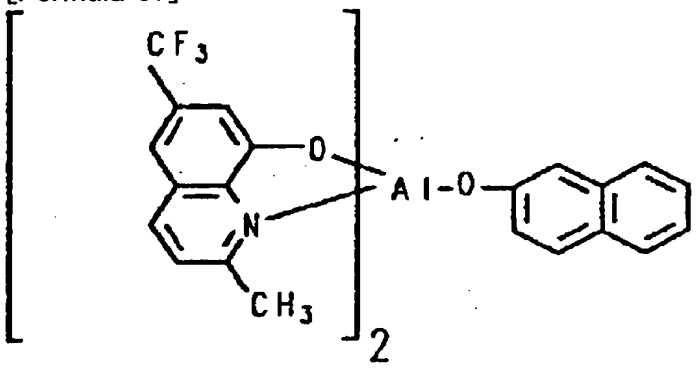
[0166] PC-25; screw (2-methyl-4-methoxy-8-quinolate) (Para-phenyl phenolate) aluminum (III)
[0167]
[Formula 35]



[0168] PC-26; screw (2-methyl-5-cyano-8-quinolate) (alt.-cresolate) aluminum (III)
[0169]
[Formula 36]



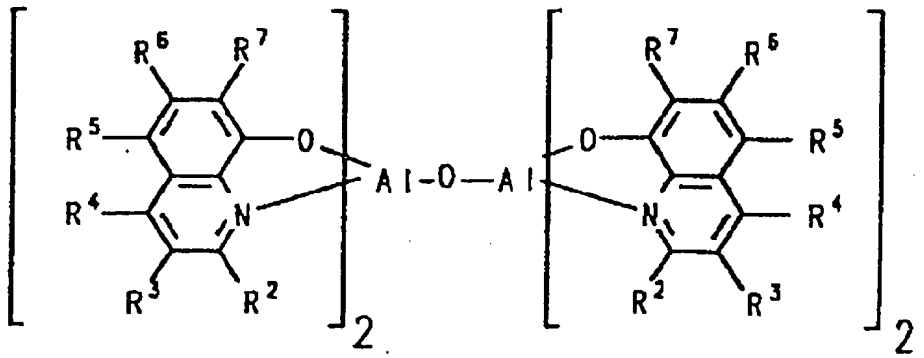
[0170] PC-27; screw (2-methyl-6-trifluoromethyl-8-quinolate) (2-naphth RATO) aluminum (III)
[0171]
[Formula 37]



[0172] Instead of using a screw (Rs-8-quinolate) (phenolate) aluminum (III) chelate as mentioned above for blue luminescence, using the luminescent blue screw (Rs-8-quinolate) aluminum (III)-mu-oxo-screw (Rs-8-quinolate) aluminum (III) compound as a luminescent blue luminous layer is meant. United States patent ****** to which using these compounds for organic electroluminescence equipment was. transferred [of VanSlyke] It is taught to No. 738,776 (name of the January, 1991 eight-day application and invention "IMPROVED BLUE EMITTING INTERNAL JUNCTION ORGANIC ELECTROLUMINESCENT DEVICE (I)"). These compounds fill the following large formulas and are : [0173].
[Formula 38]
(XI)

$$(R^S\text{-}Q)_2\text{-}Al\text{-}O\text{-}Al\text{-}(Q\text{-}R^S)_2$$

[0174] And a desirable mode is : [0175] which fills the following formulas specially.
[Formula 39]
(XII)



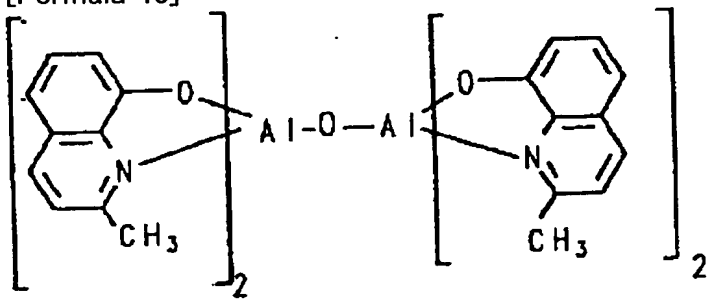
[0176] The inside of an upper type, and Q and Rs And R2 -R7 It is the same as what was previously

indicated in relation to Formulas VIII and X.

[0177] The following compounds are Formulas XI and XII. : of the desirable compound to fill which is an example specially [0178] BA-1; screw (2-methyl-8-quinolate) aluminum (III)-mu-oxo--screw (2-methyl-8-quinolate) aluminum (III)

[0179]

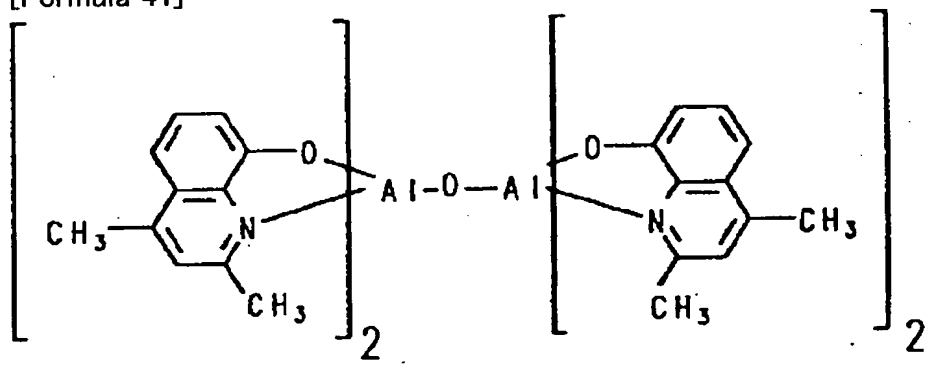
[Formula 40]



[0180] BA-2; screw (2, 4-dimethyl-8-quinolate) aluminum (III)-mu-oxo--screw (2, 4-dimethyl-8-quinolate) aluminum (III)

[0181]

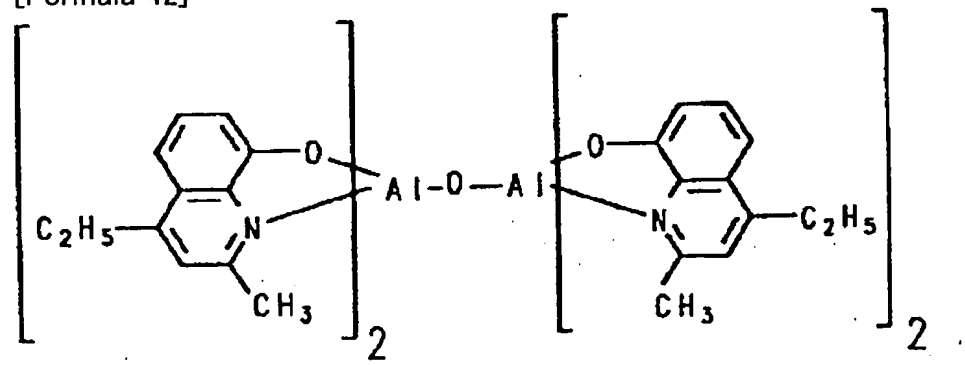
[Formula 41]



[0182] BA-3; screw (4-ethyl-2-methyl-8-quinolate) aluminum (III)-mu-oxo--screw (4-ethyl-2-methyl-8-quinolate) aluminum (III)

[0183]

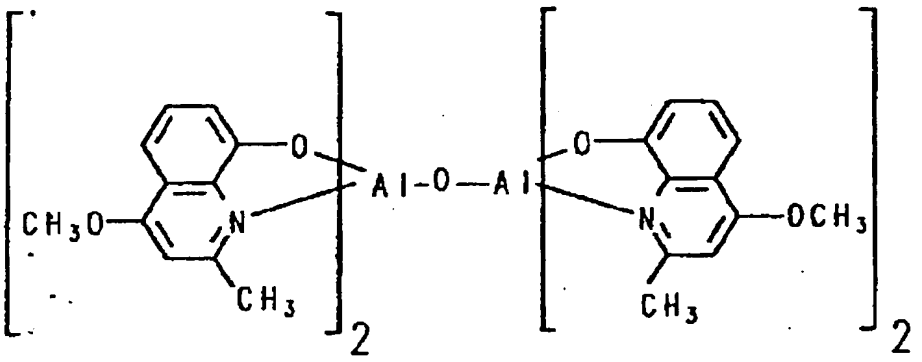
[Formula 42]



[0184] BA-4; screw (2-methyl-4-methoxy quinolate) aluminum (III)-mu-oxo--screw (2-methyl-4-methoxy quinolate) aluminum (III)

[0185]

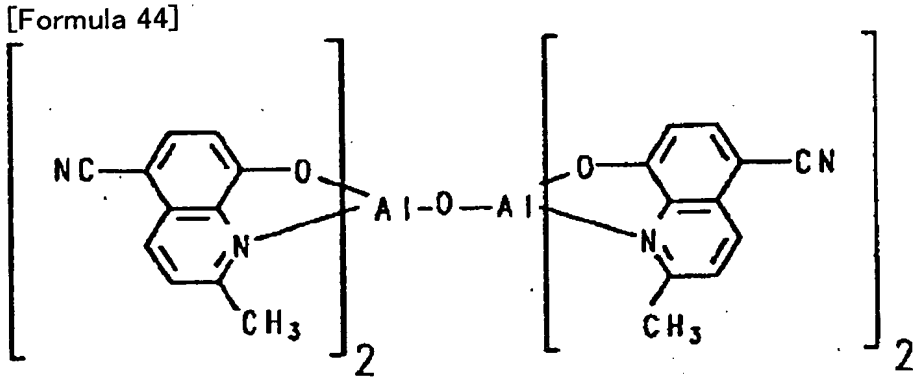
[Formula 43]



[0186] BA-5; screw (5-cyano-2-methyl-8-quinolate) aluminum (III)-mu-oxo--screw (5-cyano-2-methyl-8-quinolate) aluminum (III)

[0187]

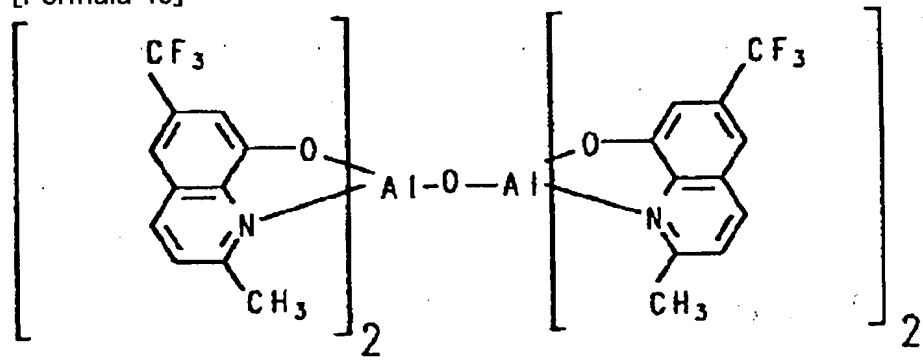
[Formula 44]



[0188] BA-6; screw (2-methyl-5-trifluoromethyl-8-quinolate) aluminum (III)-mu-oxo—screw (2-methyl-5-trifluoromethyl-8-quinolate) aluminum (III)

[0189]

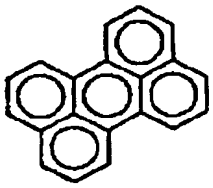
[Formula 45]



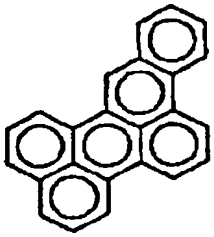
[0190] The luminous layer in 1 set of secondary pixels is formula VIII-XII. It can creep of [any / one] the blue luminescence compounds again, and can also consist of that combination. United States patent ****** of Tang and others previously quoted instead of using a blue luminescence compound independently in a luminous layer According to instruction of a No. 4,769,292 specification, it can be used as a host for blue luminescence fluorochromes. One or more sorts of fluorochromes and formula VIII-XII The blue luminescence mixture of arbitration with one or more sorts of compounds which fill inner either can be used.

[0191] In one desirable mode of this invention, the blue luminescence part of an organic electroluminescence medium is formula VIII-XII as a host. A compound and at least one sort of blue luminescence fluorochromes containing perylene or a benzopyrene coloring unit are contained. These coloring units need 20 carbon atoms in at least five condensation ring type rings and these rings. Another condensed ring which does not decrease the blue luminescence can be made to contain in a

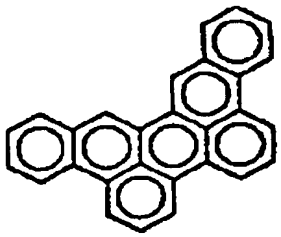
coloring unit. It is desirable to use the coloring unit containing 20–40 ring carbon atoms generally.
[0192] The following compounds are : [0193] which shows the instantiation–compound which has the use as a blue fluorochrome containing perylene or a benzopyrene system coloring unit meant.
[Formula 46]
FD-1 ペリレン



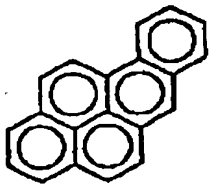
FD-2 ベンゾ〔b〕ペリレン



[0194]
[Formula 47]
FD-3 ジベンゾ〔f g, i j〕ペンタフェン

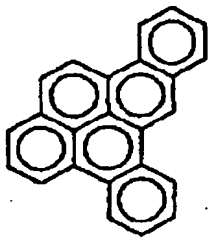


FD-4 ベンゾ〔a〕ピレン

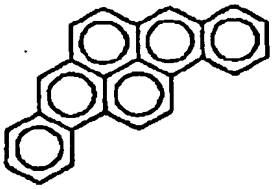


[0195]
[Formula 48]

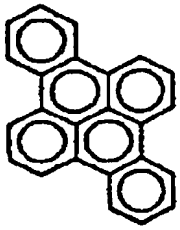
FD-5　　ジベンゾ〔a，e〕ピレン



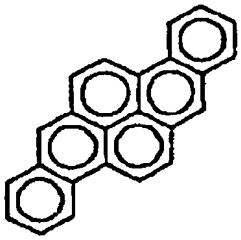
FD-6　　ジベンゾ〔b，h〕ピレン



[0196]
[Formula 49]
FD-7　　ジベンゾ〔e，l〕ピレン

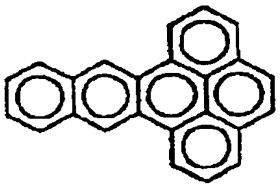


FD-8　　ジベンゾ〔a，h〕ピレン

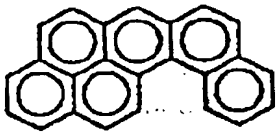


[0197]
[Formula 50]

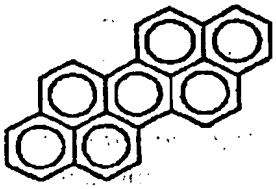
FD-9　ジベンゾ〔d e，q r〕ナフタセン



FD-10　ジベンゾ〔c，Mn〕クリセン



[0198]
[Formula 51]
FD-11　ジベンゾ〔o p q，s t u〕ピセン

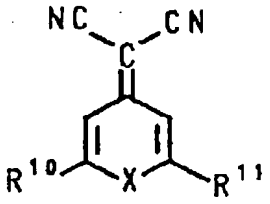


[0199] These aromatic series ring compounds have an advantage of the ability to make it adhere with vacuum deposition like other components of an organic medium. Since the above-mentioned aromatic compound shows a chromophore for itself [these], it is not necessary to make other ring substituents exist. However, much coloring matter which contains an aromatic series ring as a chromophore is a practice, and originally, since it is manufactured in order to use it in solution chemistry, it has solubility and a substituent for improving a hue depending on the case. United States patent ****** of Tang and others quoted previously Various kinds of aromatic series ring substituents of the type currently indicated by the No. 4,762,292 specification are meant.
[0200] In case a luminescent blue luminous layer is manufactured, when using one sort of the above-mentioned blue luminescence aluminum chelate, it is Formula VII between a luminescent blue luminous layer and the second electrode on it. Effectiveness of higher level is realized by making one sort of an oxy-NOIDO compound insert. This arrangement is desirable when a blue luminous layer corresponds to a part for the first of the organic electroluminescence medium in a part for part I of the organic electroluminescence medium in equipments 100 and 200, and equipments 300 and 400, or part II. In another arrangement, another new layer can be adhered so that a blue luminescence aluminum chelate may not contact the second electrode on it directly.
[0201] An above-mentioned layer can supply blue and green luminescence required for all color image formation. In order to attain new red luminescence from 1 set of secondary pixels required for all color image formation, both desirable green and blue emitters are combinable with the conventional red luminescence fluorochrome. [both / above-mentioned either or / above-mentioned] This type of desirable configuration is United States patent ****** of Tang and others quoted previously. It is indicated by the No. 4,769,292 specification.
[0202] an organic host ingredient -- one of the above-mentioned green or the blue luminescence ingredients is preferably combined with a red luminescence fluorochrome. Although many red luminescence fluorochromes are indicated by Tang and others as it is useful, especially the thing for which a red luminescence fluorochrome is chosen from the 4-dicyanomethylene-4H-pyran of

fluorescence and 4-dicyanomethylene-4H-thiopyran (these are henceforth called a fluorescence dicyanomethylene pyran and thiopyran coloring matter) is desirable. This kind of desirable fluorochrome is : [0203] which fills the following formulas.

[Formula 52]

(XIII)



[0204] X expresses oxygen or sulfur among an upper type, and R10 expresses 2-(4-amino styryl) radical, and R11 expresses the two R10th set, an alkyl group, or an aryl group.

[0205] Although it is most convenient that X expresses oxygen or sulfur, and bigger chalcogen than that of the atomic number is a bathochromic shift, offering the same response is recognized. The amino group can be the second or third amino group for a start. In one desirable mode, the amino group can form at least one another condensed ring with a styryl phenyl ring especially. For example, a styryl phenyl ring and the amino group can form a styryl phenyl ring, condensed 5 members, or six membered-rings. An alkyl group R11 is a phenyl group preferably. Although the radical may be the same or it may be another when both R10 and R11 form 2-(4-amino styryl) radical, the direction of a symmetrical compound is compounded conveniently.

[0206] The following An instantiation fluorescence dicyanomethylene pyran And :FD-12;4- which is thiopyran coloring matter (Dicyanomethylene) -2-methyl-6- (p-dimethylaminostyryl)-4H-pyran FD-13;4-(dicyanomethylene)-2-phenyl-6-[2-(9-YURORIJIRU) ethenyl]-4H-pyran FD-14;4-(dicyanomethylene)-2 and 6-JI [2- Ethenyl]-4H-pyran FD-15;4- (9-YURORIJIRU) (dicyanomethylene) -2-methyl-6-[2-(9-YURORIJIRU) ethenyl]-4H-pyran FD-16;4-(dicyanomethylene)- 2-methyl-6-[2-(9-YURORIJIRU) ethenyl]-4H-thiopyran [0207] If a red luminous layer is separated from the direct contact to the second electrode on it in the case of the above-mentioned blue luminous layer, the engine performance of higher effectiveness will be realized.

[0208] According to instruction of Tang and others quoted previously, when using a fluorochrome combining a host compound, it is selected so that the band gap whose fluorochrome is not larger than a host's band gap, and reduction potential with the width of face of the negative value smaller than a host's reduction potential may be shown. furthermore, the combination of a host compound and a fluorochrome -- them -- a spectrum -- when a host compound is used independently, it is selected so that light may be emitted on the wavelength corresponding to the absorption wavelength of a fluorochrome, so that it may join together-like. For the optimal association, the peak emission wavelength of a host compound is **25 nm the optimal less than **100 nm of the peak absorption wavelength of a fluorochrome. Dealing with less than is desirable.

[0209] A fluorochrome can be made to contain in the amount of the convenient arbitration for hue migration. Although Tang and others quoted previously has suggested 10 -3-10-mol % of density range on the basis of the total quantity of a host and coloring matter, to use by low concentration more is more desirable. Desirable fluorochrome concentration is in the range of 0.05 - 5 (the optimal 0.2-3) mol % on the basis of the number of mols of a fluorochrome and a host.

[0210] The second electrode is combination with one or more sorts of metals in which an independent or higher (>4.0 eV) work function is shown, and can use for and manufacture one of the metals (except for alkali metal) in which a lower (<4.0 eV) work function is shown. However, the second electrode is Tang's and others United States patent ******. It is desirable to build according to instruction of a No. 4,885,432 specification. Even if there are few second electrodes in an interface with the organic electroluminescence medium with an especially desirable configuration as at least 50% of magnesium 0.1% (the optimal at least 1%) of work function contains a bigger metal, for example, silver, than 4.0 eV or

aluminum. After making the metal which forms an interface with an organic electroluminescence medium adhere as mentioned above, by making the metal of convenient arbitration adhere, the second electrode is thickened, and electric conductivity can be increased, without reducing electron injection effectiveness. If a high (>4.0 eV) metal is used for this purpose, the stability of the second electrode will also increase.

[0211] This invention is described about the desirable embodiment. That is, since both an organic electroluminescence medium and the second electrode are formed with the gestalt by which those requests were patternized, etching for subsequent patterning or an ingredient removal process are not needed at all. Although it is not a desirable mode, after making the ingredient which forms the second electrode adhere to homogeneity on an organic electroluminescence medium, it is recognized that it can patternize by the conventional masking and etching technique. When adopting this approach, since it is the only function of these walls to patternize the second electrode, walls 105, 205, 305, and 405 can be omitted. When walls 205 or 405 are omitted, a wall 203, or 403a and 403b can be a continuation wall which joins all the pixels and secondary pixels in the same line. All the walls of equipments 200 and 400 are preferably formed by single processing, and although it is the thing of the same height desirable in this way, it is recognized that the relation of the 205 pairs of walls wall 203 or the height of the 405 pairs of walls walls 403a and 403b may be the same as the relation of the height of the 105 pairs of walls wall 103.

[0212] With equipment 100, between walls 103, although it is described by equipment 200 that it spreads between wall 403a with equipment 300, and has spread in the longitudinal direction between wall 303a and with equipment 400 between walls 203, as for a pixel, it is recognized that the boundary of a pixel is selected on [of a publication] expedient. Instead, each pixel may be regarded as being shifted by one secondary pixel in the longitudinal direction within each train. When seeing a pixel boundary such, although Walls 103, 203, 303a, and 403a are arranged still more on the secondary pixel boundary, they are not in a pixel boundary. However, an actual change does not take place to the structure of equipment.

[0213]

[Effect of the Invention] The point that the image display engine performance which shows the operating characteristic which is equal to similar organic electro luminescent equipment without the image display engine performance, and the engine performance which shows a multi-colored picture image display occur is the advantageous description of at least one embodiment of this invention.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the top view showing the first embodiment of this invention which cut off the part.
[Drawing 2] It is the abbreviation sectional view showing the processing process of two pixels of the first embodiment of this invention.
[Drawing 3] It is the abbreviation sectional view showing the processing process of two pixels of the first embodiment of this invention.
[Drawing 4] It is the abbreviation sectional view showing the processing process of two pixels of the first embodiment of this invention.
[Drawing 5] It is the top view showing the second embodiment of this invention which cut off the part.
[Drawing 6] It is the top view showing the pixel of the second embodiment of this invention.
[Drawing 7] It is the sectional view which met the line 7–7 of drawing 6 .
[Drawing 8] It is the sectional view which met the line 8–8 of drawing 6 .
[Drawing 9] It is the top view showing the third embodiment of this invention which cut off the part.
[Drawing 10] It is the abbreviation sectional view showing the processing process of one pixel of the third embodiment of this invention.
[Drawing 11] It is the abbreviation sectional view showing the processing process of one pixel of the third embodiment of this invention.
[Drawing 12] It is the abbreviation sectional view showing the processing process of one pixel of the third embodiment of this invention.
[Drawing 13] It is the abbreviation sectional view showing the processing process of one pixel of the third embodiment of this invention.
[Drawing 14] It is the abbreviation sectional view showing the processing process of one pixel of the third embodiment of this invention.
[Drawing 15] It is the top view showing the fourth embodiment of this invention which cut off the part.
[Drawing 16] It is the top view showing the pixel of the fourth embodiment of this invention.
[Drawing 17] It is the sectional view which met the line 17–17 of drawing 16 .
[Drawing 18] It is the sectional view which met the line 18–18 of drawing 16 .
[Description of Notations]
100,200,300,400 -- Organic electroluminescence equipment
101 -- Insulating substrate
103, 105, 203, 205, 303,305,403,405 -- Wall
207 -- Insulating pad

[Translation done.]